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VOLUME 9 • OCTOBER 1951 • NUMBER 4 JOURNAL OF ORAL SURGERY

Eosinophilic granuloma of bone

■ *Myron Kaufman, D.D.S., Detroit*

Eosinophilic granuloma of bone was first reported under this heading by Jaffe and Lichtenstein,[1] in 1940, when they described several cases of solitary bone lesions which were apparently inflammatory in nature and whose cytologic picture was characterized by the presence of large numbers of histiocytes. They reviewed the previous literature and found that the presence of eosinophils in such lesions was reported earlier but was misrepresented as known disease processes with special characteristics. Funzi[1] reported a similar case in 1929 under the title "myeloma with prevalence of eosinophilic cells," and Mignon[1] reported a case in 1930 under the heading of "a granulation tumor of the frontal bone." Schairer,[1] in 1938, reported two cases of a benign disease of the child skull as "osteomyelitis with eosinophilic reaction." These reports are not adequate in description but do resemble "eosinophilic granuloma" to a remarkable degree. In 1940, Hatcher[2] and Mallory[3] reported cases under the title "eosinophilic granuloma of bone" and Otani and Ehrlich[4] reported similar cases describing the same type of lesion which they named "solitary granuloma of bone."

Green and Farber[5] state that before the granulomatous character of this lesion was recognized, the first few cases were diagnosed as a peculiar form of osteomyelitis, or a neoplasm, probably an atypical myelocytic myeloma.

A short time after their original report, Jaffe and Lichtenstein[6] discovered that these lesions were not necessarily solitary but that multiple bone lesions of this nature may affect the skeleton. Farber[7]

From the department of oral surgery, Mt. Carmel Mercy Hospital, Detroit, Mich.

1. Lichtenstein, Louis, and Jaffe, H. L., Eosinophilic Granuloma of Bone, With Report of a Case. *Am. J. Path.* 16:595 (Sept.) 1940.

2. Hatcher, C. H., Eosinophilic Granuloma of Bone. *Arch. Path.* 30:828, 1940.

3. Mallory, T. B., Eosinophilic Granuloma of Bone. *New England J. Med.* 223:149 (July) 1940.

4. Otani, Sadao, and Ehrlich, J. C., Solitary Granuloma of Bone Simulating Primary Neoplasm. *Am. J. Path.* 16:479 (July) 1940.

5. Green, W. T., and Farber, S., "Eosinophilic or Solitary Granuloma" of Bone. *J. Bone & Joint Surg.* 24:499 (July) 1942.

6. Jaffe, H. L., and Lichtenstein, Louis, Eosinophilic Granuloma of Bone; Condition Affecting One, Several or Many Bones, but Apparently Limited to the Skeleton, and Representing Mildest Clinical Expression of Peculiar Inflammatory Histiocytosis Also Underlying Letterer-Siwe Disease and Schüller-Christian Disease. *Arch. Path.* 37:99 (Feb.) 1944.

7. Farber, S., The Nature of "Solitary or Eosinophilic Granuloma" of Bone. (Scientific Proc.) *Am. J. Path.* 17:625, 1941.

confirmed this observation and stressed the peculiar granulomatous character of the lesion and in a publication with Green[5] proposed the name "destructive granuloma of bone."

Jaffe and Lichtenstein[6] objected to "destructive granuloma of bone," single or multiple, as nondescript, because gummatous syphilitic lesions involving one or more bones are destructive granulomas.

The term "solitary granuloma of the bone," as proposed by Otani and Ehrlich, was also called nondescript since it leaves out the idea of eosinophils, which characterize the lesions histologically, and also because the process may be present in several bones.

In reference to this comment, Otani in a discussion with Farber[7] stated that since his group reported a case which did not reveal conspicuous numbers of eosinophilic leukocytes in the lesion, although it was otherwise typical of this granuloma, they prefer the term "solitary granuloma" to "eosinophilic granuloma." Green and Farber[5] also stated that "in a somewhat older stage of the disease process, eosinophils are no longer present." However, Jaffe and Lichtenstein[6] state that they have never seen a case with disappearance of eosinophils before complete healing has occurred.

In general, "eosinophilic granuloma of bone" has become the accepted descriptive term for this disease in the literature published subsequent to these early reports.

■ *Etiology*

Otani and Ehrlich[4] concluded from observations of their cases that trauma may play some role in initiating the lesion, but the peculiar and unusual form which the response to this trauma assumes indicates that some as yet unknown factor is responsible for this reaction. Various vague conjectures have been made as to etiology but none have been substantiated by positive proof to this date.

■ *Clinico-Anatomical Features*

The lesion characterizing the disease is usually seen in children and adolescents, and occasionally in young adults. About 80 per cent of the cases reported in the literature were in children. It is extremely rare in persons over the age of 25. However, Baker and others[8] reported a case involving a 39 year old man; Otani and Ehrlich[4] reported a case in a 35 year old man, and Versiani, Figueiro and Junqueira[9] reported a lesion in a 50 year old woman. Any bone can be the site of a lesion in the single or multiple manifestations of the disease, although the bones of the hands and feet have never been observed to be affected. In cases of multiple involvement lesions have been reported in as many as eight bones[6] and also with as many as 21 lesions involving a single bone.[7] In the cases with multiple involvement, the bones most commonly affected are the bones of the cranial vault, ribs, vertebrae and long bones, especially the humerus and femur.

In multiple involvement, it may be only one lesion that creates local clinical difficulties, the others being silent at first

8. Baker, W. J., Houghton, J. D., Wissing, E., and Betts, R. H.: Eosinophilic Granuloma: Report of Case With X-ray Evidence of Rapid Progression. *New England J. Med.* 238:626 (April) 1948.

9. Versiani, O., Figueiro, J. M., and Junqueira, M. A.: Hand-Schüller Christian's Syndrome and "Eosinophilic or Solitary Granuloma of Bone." *Am. J. M. Sc.* 207:161 (Feb.) 1944.

or even throughout the disease. This fact suggests that occasional cases with multiple bone involvement may entirely escape detection. The disease occurs more frequently in male than female patients.

■ *Symptoms*

Systemic complaints are absent in most instances of this disease. However, fever, malaise, weight loss, leukocytosis or eosinophilia have been noted occasionally. Physical examination is generally negative except for the local lesion. Complaints usually stem from the skeletal lesions, and these complaints depend on the bone involved and its proximity to the surface. Usually, even with multiple involvement, it is one lesion which is clinically symptomatic while the other lesions are silent.

If the involved bone is superficial, swelling may be the first symptom. Local tenderness and pain are common symptoms. The part involved usually influences the symptoms; that is, a vertebral lesion may cause a local spinal deformity, a lesion of the neck of the femur may cause a limp, a lesion of the facial bones may cause facial asymmetry.

The patients' complaints of onset of symptoms may vary from a few days to several months, depending mainly on the site of greatest affection. The natural course usually runs from a few months to a year or more.

■ *Roentgenographic Features*

The roentgenographic picture is not distinctive for it may simulate any of several diseases such as multiple myeloma, Ewing's tumor, metastatic skeletal tumors and, in cases with skull lesions, Schüller-Christian's disease.[2]

The lesion appears as a radiolucent zone, more or less circular, sharply demarcated, giving a "punched-out" effect to the bone. The lesion begins in the bone interior, increases fairly rapidly in size, expanding the cortex, causing deformity and pain. Perforation or fracture may occur. Where pathologic fractures have occurred new periosteal bone deposits may be seen.

■ *Pathology*

Grossly, material curetted from a skeletal lesion appears as a hemorrhagic cystic type of soft granulation tissue which may bear evidence of necrosis.

Observations by Jaffe and Lichtenstein[6] led them to conclude that the disease appears to have a predilection for the hemopoietic system since the lesions seem to represent an inflammatory reaction to some unknown infectious agent with the resultant basic cell production of large numbers of histiocytes. These investigators maintain that the histiocytes are derived from the multipotent reticulum cells in the adventitia of the blood vessels in the marrow.

The lesion as first described by them was characterized histologically by sheets of histiocytes, some of which were phagocytic, and among which were interspersed accumulations of eosinophilic cells, especially eosinophilic leukocytes and giant cells. Histologically, Otani and Ehrlich[7] state that these histiocytes are large polygonal cells with an abundant pale cytoplasm whose processes interconnect with those of neighboring cells. There is a single, large, pale oval nucleus with a thin nuclear membrane. The eosinophils usually predominate the entire picture and

are usually neutrophils and lymphocytes. The small size of the eosinophils refutes the possibility that they may be eosinophilic myelocytes.[6] In tissue that has been left too long in decalcifying fluid, it may be difficult to demonstrate these eosinophilic leukocytes. The giant cells are scattered about in small groups, are of varying size and shape, and contain 4 to 10 nuclei in their central portion. None are found in the pericapsular extensions of the process.

The products of destruction seen in the necrotic zone are granular debris, blood, serum, degenerated cells, occasional foam cells, depositions of blood pigment and infrequent fragments of destroyed bone. Where repair has occurred callus bone deposition is seen in the capsule of the lesion. Its main trabeculae are laid down in a radial fashion. Areas of fibrosis are present within the granuloma and in the pericapsular region.

Otani and Ehrlich[4] in their original publication regarded eosinophilic granuloma as a separate clinicopathologic entity, not to be confused with xanthomatosis or systemic reticulo-endothelial granuloma which is the generic term used by Wallgren,[10] in 1940, to include Letterer-Siwe disease and Schüller-Christian's disease. However, Farber[7] is given full credit for the idea of interrelating the lesion of eosinophilic granuloma to that of Letterer-Siwe disease and Schüller-Christian's disease on the basis of the pathologic studies and clinical and roentgenographic characteristics of the three diseases. He states that they differ from one another only in the degree and site of involvement and the duration of the process.

In a discussion following Farber's[7] presentation Lichtenstein sided with Otani and Ehrlich in the belief that this was a new and distinct entity. Gross and Jacox[11] expressed agreement with Farber and associates[12] on the basic interrelationship of the disease processes. In his later article Lichtenstein[6] agreed that all three conditions represent variations of the same basic disease process.

Mallory,[13] in 1942, schematized the clinical gradations of the basic disorder underlying the three disease processes:

1. The disorder may manifest itself in infancy or very early childhood in an often rapidly fatal form in which the histiocytic lesions are widely distributed through the soft tissues (especially the lymphoid tissues) and the skeleton.

This clinical picture was described as Letterer-Siwe disease, reticulosis, or nonlipoid histiocytosis.

2. The disorder may appear in children or adults in a chronic form in which the histiocytic lesions are similarly not limited to the skeleton and tend to undergo collagenization and lipidization and in which the prognosis is often still grave because of the possibility of damage to the lungs, heart, brain, and pituitary gland.

This was described as Schüller-Christian's disease or lipogranulomatosis.

3. The disorder may be seen in children or young adults in a relatively benign and more localized form in which the lesions occur only

10. Wallgren, A., Systemic Reticulo-endothelial Granuloma. *Am. J. Dis. Child.* **60**:471 (Sept.) 1940.

11. Gross, P., and Jacox, H. W., Eosinophilic Granuloma and Certain Other Reticulo-Endothelial Hyperplasias of Bone: Comparison of Clinical, Radiologic, and Pathologic Features. *Am. J. M. Sc.* **203**:673 (May) 1942.

12. Farber, S., Green, W. T., and McDermott, L. J., A Recently Defined Destructive Lesion of Bone. (Report of Meeting of Boston Orthopedic Club of Jan. 20, 1941.) *New England J. Med.* **224**:832 (May) 1941.

13. An Appreciation to Frank Burr Mallory. *New England J. Med.* **226**:279 (Feb.) 1942.

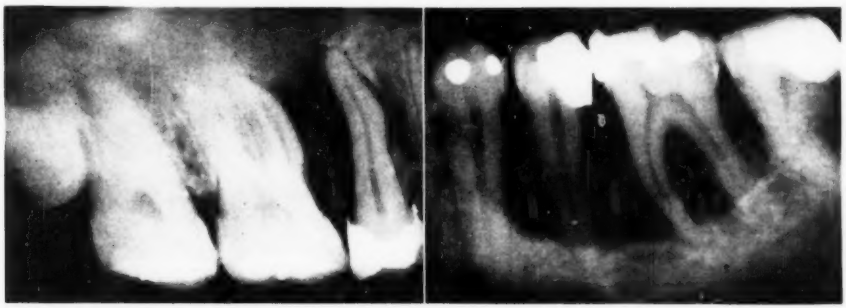

Fig. 1.—Left: Intraoral roentgenograms of maxillary left bicuspid and molar region disclosing eosinophilic granuloma causing interproximal destruction of alveolar bone simulating a localized pyorrhea alveolaris. Note invasion of maxillary sinus by destructive process at apex of second bicuspid. Right: Intraoral roentgenogram of mandibular right bicuspid and molar region presenting a similar condition to that seen in the maxilla

in the skeleton (single or multiple) and whose prognosis is less severe since they apparently heal after simple curettage and often resolve without any specific treatment.

This is called eosinophilic granuloma of bone.

■ *Epidemiology*

Jaffe and Lichtenstein[6] cultured tissue from a few lesions for bacteria and viruses and results were negative. In further studies for evidence of virus infection, material from two lesions was inoculated into mice, rabbits and guinea pigs by various routes, including the intratesticular and intracerebral, again with negative results.

■ *Diagnosis*

"Because the x-ray appearance of eosinophilic granuloma may be indistinguishable from other inflammatory lesions, multiple myeloma or metastatic tumor, a biopsy is usually indicated"[14] for a definite confirming diagnosis.

■ *Laboratory Findings*

Laboratory findings are entirely unrevealing. Temperature, pulse, sedimentation rate, blood calcium, phosphatase, cholesterol, white blood count and differential count as well as urinalysis are normal. No general eosinophilia is found.

■ *Differential Diagnosis*

The solitary lesion must be differentiated from primary bone tumors such as benign giant cell tumor, chondroma, chondrosarcoma, solitary bone cyst and various types of specific (syphilitic, tuberculous) and nonspecific osteomyelitis by biopsy.

Multiple lesions must be differentiated from multiple myeloma, metastases of neuroblastoma or of lymphoma, generalized osteitis fibrosa cystica, Hodgkin's disease, leukemia, hyperparathyroidism and Ewing's tumor.

14. Dundon, C. C., Williams, H. A., and Lapply, T. C.: Eosinophilic Granuloma of Bone. *Radiology* 47:433 (Nov.) 1946.

■ *Treatment*

Treatment was originally evolved by empiricism. The lesions heal readily after simple curettage even without supplementary roentgen irradiation of the site and may even heal by resolution without any form of therapeutic treatment. Radiation has been used in cases with multiple lesions after an initial diagnosis was made by curetting one of these lesions, but it is not certain that roentgen therapy accelerates the healing process. Where possible, curettage is the treatment of choice.

■ *Prognosis*

Prognosis is excellent and healing is rather prompt, particularly in cases with solitary lesions. A death from eosinophilic granuloma has never been recorded, nor have visceral lesions been described with domination by eosinophils equivalent to those seen in the bones.

■ *Report of Case*

A man, aged 22, came to the oral surgery department on August 31, 1948, complaining of pain in the left maxilla and

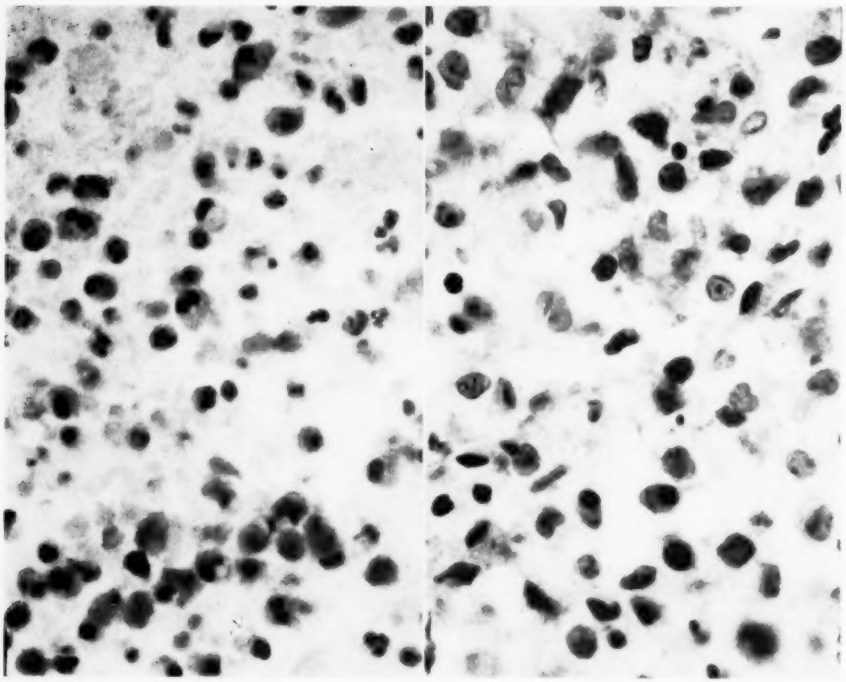

Fig. 2.—Specimens from maxilla and mandible showing typical eosinophilic granuloma illustrating numerous eosinophils, few plasma cells and occasional lymphocytes and neutrophils. Also shown are an admixture of large mononuclear cells (histiocytes) and eosinophilic polymorphonuclear cells. (X 500)

Fig. 3.–Single lesions of eosinophilic granuloma in the right and left femurs with destruction of the cortex on the lateral surface of the right femur (left)

right mandible with tenderness and looseness of several teeth in these regions. The patient's history was essentially negative, and he could give no definite information regarding the onset of the disturbance.

EXAMINATION—Physical examination revealed a well developed, well nourished white male in no apparent acute distress. Intraoral examination disclosed a complete dentition with normal functional occlusion. The maxillary left second bicuspid and mandibular right second bicuspid and first molar were extremely mobile. The mucosa in these regions appeared swollen, highly inflamed and exhibited loss of normal tone. Instrumentation with a periodontal explorer, although difficult because of tenderness in these regions, disclosed pocketlike lesions alongside the roots of the mobile teeth with loss of attaching tissues. The tongue was normally coated and the breath was somewhat fetid. Further physical examination revealed no apparent abnormalities.

Intraoral roentgenograms revealed local areas of interproximal bone destruction between the maxillary first molar and second bicuspid and between the mandibular right first and second bicuspids and first molar. The destructive process extended to the apexes of these teeth (Fig. 1).

This condition appeared to be a localized form of periodontitis of indeterminate etiology. Removal of the teeth with

Fig. 4.—Postoperative intraoral roentgenograms eight days after extraction of teeth involved by the granulomatous process and curettement of the regions

curettement of the involved regions was advised.

OPERATION—Under local anesthesia, the maxillary left second bicuspid and first molar, and the mandibular right first and second bicuspids and first molar were removed. The granulation tissue was curetted from the regions. Invasion of the maxillary sinus by the destructive process was noted above the apex of the left second bicuspid. This tissue was friable, granular gray, and in the major part was adherent to the roots of the involved teeth. The specimens were submitted for biopsy.

PATHOLOGY — Microscopic examination of the surgical specimens showed the typical histology of eosinophilic granuloma. There were broad zones of a loose, poorly vascularized granulation tissue in which macrophages and eosinophils were present in equal proportions. Mingled with this tissue were zones of necrosis bordered by a more acute granulation tissue in which polymorphonuclear leukocytes predominated. Several of the sections showed small islands of regular squamous epithelium enmeshed in the necrotic zones. The same histopathologic picture was present in sections of the material from both upper and lower jaws (Fig. 2).

A final diagnosis of eosinophilic granuloma of the maxilla and mandible was made.

FOLLOW-UP—On the basis of the pathologic diagnosis, the patient was recalled on September 28, 1948, and complete skeletal roentgenograms were taken, which revealed single lesions in the right and left femurs (Fig. 3). Complete healing of the intraoral regions had occurred (Fig. 4).

■ *Summary*

Eosinophilic granuloma of bone was first reported as such in 1940, but reviews of the previous literature revealed scattered incomplete reports of cases of solitary bone lesions descriptive of this disease as early as 1929. The lesion is of a granulomatous nature, characterized cytologically by conspicuous numbers of eosinophilic leukocytes; these properties

account for the present terminology. About 80 per cent of the cases reported have been in children. The disease has been manifested by single or multiple lesions affecting any bone except the hands and feet. Etiology is unknown, but many cases indicate trauma may have some initiating effect. Symptoms usually stem from the skeletal lesions, systemic complaints being characteristically absent in most instances. The majority of investigators believe that eosinophilic granuloma is interrelated with Letterer-Siwe disease and Schüller-Christian's disease, and that it represents a relatively benign and more localized form of the same basic disease process. Definite diagnosis is made by microscopic examination of biopsy material from the lesions. Treatment is empirical, simple curettage being the treatment of choice. Prognosis is excellent.

A case report is presented in which the disease process was first discovered from histologic examination of lesions involving the alveolar bone of the maxilla and mandible. Subsequent roentgenographic studies revealed further skeletal involvement in the right and left femurs.

Management of impacted maxillary third molars

■ *Irvin V. Uhler, D.D.S., Lancaster, Pa.*

A review of the literature on impacted third molars, reveals the bulk of available material to be on the side of the mandibular impaction. Studies in the field of maxillary impactions are few. Operative complications sometimes occur because of the proximity of the maxillary sinus and the structures of the pterygomaxillary space. Its environment, the tuberosity, frequently is fragile bone, prone to fracture from the slightest misapplication of force.

This article is confined to the vertical maxillary third molar impaction, commonly removed by the general practitioner. In most cases this tooth has a small crown and a modified root curvature, usually to the distal. The roots usually are fused, but may be divergent. The tooth lies just beneath the alveolar crest and close to the distal surface of the second molar. Too frequently these problems are handled by forcing a sharply pointed elevator through the thin buccal plate distal to the second molar, and, using the second molar as a fulcrum, pressure is exerted in a backward and downward direction until the embedded tooth is forced out. The practitioner is following what he feels is the logical course of leverage and least resistance. This article presents a thorough and careful technic for the management of this type of impaction, with emphasis placed on safeguarding the surrounding structures.

A first requisite is careful roentgenographic examination revealing the entire tooth with the bone in its immediate environment. In addition to intraoral studies, it may be desirable to make occlusal and extraoral views. In making the intraoral roentgenogram, the LeMaster technic of interposing a cotton roll between the film and the alveolar process may help remove the troublesome superimposition of the malar bone.

The flap is made as follows: The mucoperiosteum over the first molar site just short of the mucobuccal fold is entered with a scalpel. The incision is carried downward and backward through the interproximal septum separating the first and second molar teeth. From this point the incision is carried along the buccogingival margin around to the distolingual aspect of the second molar tooth, and distally over the tuberosity, stopping just short of the junction of the tuberosity and the pyramidal process. The entire flap is raised with a periosteal elevator. Tenacious fibrous tissue must be removed by scalpel dissection before raising the flap, for any force applied with the elevator may tear the flap. With the flap raised, blood should be removed by suction, to assure vision for the operator.

The next step is removal of buccal and occlusal bone overlying the crown of the tooth. This may be accomplished by use of burs, or by mallet and chisel. The entire buccal and occlusal anatomy must be exposed and identified. Usually the buccal bone is thin and may be shaved away with a sharp chisel. Once these surfaces are free of bone, the tooth may be luxated in several ways.

It is well to keep in mind the complications that may arise from misapplication of luxating force. In the event of close proximity to the sinus floor, care must be used in applying forceps beaks to the crown of the tooth. Trying to force the beaks upward around the crown of the tooth may force the tooth into the maxillary sinus. If an elevator is interposed between the exposed crown and the distal surface of the second molar, misapplication of force may fracture the tuberosity, or force the tooth upward and backward into the pterygoid fossa.

To remove the tooth, interpose a thin elevator between the crown and the buccal alveolar bone. With moderate pressure the elevator is pressed against the crown of the impacted tooth, and slight lingual pressure exerted. This will frequently bring the tooth down to a point where it may be grasped with a rongeur forceps.

In the event of distal curvature of the roots, a sharp pointed elevator may be interposed between the cementoenamel junction of the impacted tooth and the mesial bone septum—never against the distal aspect of the second molar. The index finger of the free hand is placed firmly behind the posterior aspect of the tuberosity. Moderate pressure is applied by turning the elevator face downward. The finger distal to the tuberosity will prevent the tooth from slipping backward and upward into the pterygoid space. No distal pressure must be applied with the elevator, or the tuberosity may fracture. If moderate downward pressure does not rotate the tooth out of the socket, another technic must be used.

A groove, large enough to admit an elevator, can be cut into the cementoenamel junction with a bur. Downward

pressure with the elevator may deliver the tooth. If the foregoing steps fail, there is no choice but to expose the entire buccal aspect of the roots. Splitting of this tooth is not recommended, as the force necessary to split it with a mallet and chisel may drive it into the maxillary sinus, or fracture the tuberosity. Removal of the crown is also contraindicated as there may be considerable difficulty and danger in delivering the root fragments. This region presents a most delicate bony structure, and any gouging and forcing pressure may lead to complications. During luxation of the tooth, the cause of the slightest resistance or impingement must be sought out and removed, never overcome with elevator force. Buccal bone will regenerate well, but a fractured tuberosity, or an invaded sinus may inconvenience a patient for life.

With removal of the tooth accomplished, retained epithelial elements and spicules of bone are removed. Prominent or irregular bone margins are smoothed with a rongeur forceps, bone file, or antrum bur. Rarely is a drain necessary. In the average bony cavity, there is no substitute for a healthy well organized blood clot. One suture on the mesial and one on the distal of the second molar will hold the flap securely.—*310 Race Avenue.*

Blocking the mandibular nerve at the foramen ovale

■ *Ernest G. Sloman, D.D.S., D.Sc., and H. Patrick Donnelly, D.D.S., San Francisco*

A review of the literature devoted to investigative and clinical work done on injecting the mandibular nerve at or near the foramen ovale indicates a need for a simple, precise, dependable and relatively painless technic for this method of inducing regional anesthesia. It is the purpose of this paper to present a technic based on these criteria.

Most articles devoted to the technical aspects of this injection (1) emphasize variations in skull measurements and thus imply or state that the operator must rely on his best guess as to the position or place of injection,[1-4] (2) advise the use of

From the department of anatomy, College of Physicians and Surgeons, A School of Dentistry, San Francisco.

1. Horrax, G., and Poppen, J. L., Trigeminal Neuralgia. *Surg., Gynec. & Obst.* **61**:394 (Sept.) 1935.

2. Patrick, H. T., The Treatment of Trifacial Neuralgia by Means of Deep Injections of Alcohol. *J.A.M.A.* **49**:1567 (Nov.) 1907.

3. Sweet, W. H., Trigeminal Injection With Radiographic Control: Technic and Results. *J.A.M.A.* **142**:392 (Feb. 11) 1950.

4. Cushing, H., The Role of Deep Alcohol Injections in the Treatment of Trigeminal Neuralgia. *J.A.M.A.* **75**:441 (Aug. 14) 1920.

specially made, and thus difficult to obtain, instruments;[3, 5, 6, 7] (3) recite and explain the necessity for the patient to endure violent and unavoidable pain.[1-3, 7]

Heretofore, the lack of a precise procedure is documented by Cushing[4] who advised that the injection be made by practiced hands only and only by those who have the capacity to visualize deep anatomic structures. In addition he states, "This is more or less of a gift and there are no rules to follow. One introduces the needle to the nerve, a procedure which merely depends upon a working knowledge of the deep anatomy of the head."

Variation in sizes of skulls accounts for the majority of difficulties and failures reported. Differences in adult skull measurements are readily appreciated after examination of a number of skulls or any reasonable study of relationships in the dissecting room. Rarely, however, is there any consequential asymmetry of skulls (1) in distances of foramina ovalia from each other and from each foramen ovale to the closest skin surface; (2) in the relationship of each of these measurements to over-all skull width.

Offerhaus[7] and Smith[6] recognized a constancy in the relationships of the foramina ovalia to other parts of the skull. A difficulty of taking advantage of the former's information[7] is in that he relates the positions of these foramina to the upper third molars, which teeth may be missing or if present may be in altered positions by reason of drifting or orthodontic interference.

While Smith's[6] measurements coincide nearly exactly with ours, the technic he describes to take advantage of his measurements requires the use of a device neither easily made nor readily obtainable.

■ *Craniometry and Anatomy*

An examination of 240 skulls of diverse ethnic origin was made and the details were recorded to determine their widths at points corresponding to a horizontal straight line passing immediately below the foramina ovalia and laterally to the closest skin surfaces. It was determined that although there are great variations in the width of skulls—as much as 3.4 cm. for the adult skulls examined—that:

1. The straight line begins below and at the lowest point touching on the eminentia articularis on one side, passes 6 mm. below the center of the foramina ovalia and finishes on the corresponding place on the opposite eminentia (Fig. 1).

2. If the straight line be divided by three the outer thirds correspond to the distance from the skin surface to the medial borders of the foramina ovalia.

3. The widest part of the head (the zygion) is (*a*) 1.2 cm. in front of the straight line referred to in 1 and 2 above; (*b*) 3 cm. in front of a line projecting horizontally outward from the center of the external acoustic meatus; (*c*) at a point corresponding to just above the position of the center and highest point of concavity on the lower border and narrowest part of the zygomatic arch (prearticular notch).

5. Grant, F. C., An Anatomic Study of Injections of the Second and Third Divisions of the Trigeminal Nerve. *J.A.M.A.* 78:794 (March 18) 1922.

6. Smith, A. E., Block Anesthesia and Allied Subjects. St. Louis: C. V. Mosby Company, 1920, p. 814.

7. Braun, Heinrich, Local Anesthesia, Shields, M. Percy, translator. Philadelphia: Lea & Febiger, 1914.

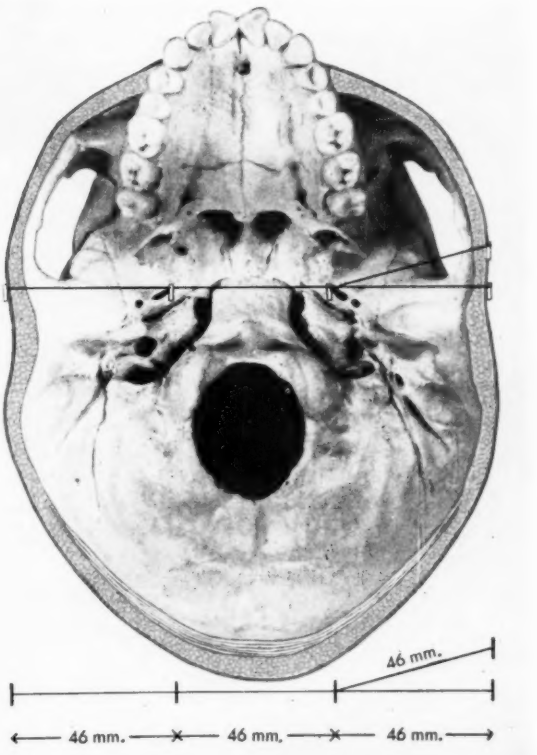

Fig. 1.—The base of the skull. Showing the relationships of the foramina ovalia to each other and to the nearest skin surface by way of a straight line passing beneath each articular eminence. The oblique line beginning immediately below the zygion shows the path of the injection

4. If a straight line measuring a third of the greatest width of the head be extended from 1 cm. below the widest part of the head (and thus nearly 1 cm. below the lower border of the zygoma) horizontally medialward and backward (12 degrees) it will end under the foramen ovale 6 mm. below its center.

5. The straight line with the backward direction does not pass through any of the elements of the temporomandibular articulation and passes well below the pterygoalar ligament which ligament will be explained later in this article.

The width of adult skulls examined varied from 10.7 cm. to 14.1 cm., the average being 12.6 cm. Nine millimeters, which was determined through examination of adult cadavers to be the total average thickness of soft tissues overlying both zygomatic arches, were added to give the over-all width of the head at the widest part in living subjects. In every

instance it was found that the centers of foramina ovalia were located at a depth which measured exceedingly close to a third of the widest portion of the face.

After recording the data on skull width, as compared with foramina ovalia relationships, a determination was made as to the number and percentage of injections that, if made through the technic herein recommended, would place the needle aperture within the substance of the mandibular nerve. Recordings were made of 240 skulls and thus for 480 foramina ovalia head-width relationships. It was calculated that the needle would be outside the nerve in but one skull and only on one side for that skull. In this one instance the technic to be described would place the needle aperture at 1.5 mm. from the surface of the nerve.

If the nerve is approached according to the technic described the approach is toward but just below a broad side of an elliptic surface. If the nerve were of the same proportions 12 mm. below its exit from the foramen ovale then only 80 per cent of the injections—according to the technic recommended—would be in the substance of the nerve. There are two factors that reduce the failures to place the needle aperture within the nerve to but one instance outside the nerve in the 240 skulls examined.

1. The combined areas of cross sections of the branches of any nerve are always greater than the area of a cross section of the nerve from which the branches orginate.

2. The mandibular nerve emerges in proportion to and in the cross section shape of its foramen ovale. As it descends it assumes a cylindrical form; that is, less oval or elliptic.

If these two factors change the width of the nerve from the approach described by 2 mm., then only one injection in 480 is outside the nerve and that one injection would be only 1.5 mm. from the nerve surface and thus sufficiently close to afford satisfactory anesthesia.

There are many variations in the size and shape of foramina ovalia. They vary in shape from egg to circular to elliptic, and from 2 to 11 mm. across the narrow width.

Of 480 measurements made on the width of foramina ovalia it was found that the smallest measured 2 mm. across and the largest 10 mm. across. The percentage distribution is as follows:

2 mm.	7.3 per cent
3 mm.	21.2 per cent
4 mm.	35.2 per cent
5 mm.	21.9 per cent
6 mm.	9.2 per cent
7 mm.	3.2 per cent
8 mm.	0.9 per cent
9 mm.	0.7 per cent
10 mm.	0.4 per cent

In each of the 480 measurements it was determined how far the needle aperture would be from the center of the nerve if an injection were made on the basis of the technic hereinafter described. The greatest variation on right sides was 4.2 mm. In this instance the nerve emerged through a foramen ovale 8 mm. wide; thus the calculated width of the nerve at the position of the injection was 10 mm. While the needle aperture in this instance would be 4.2 mm. from the

center of the nerve trunk it would still be within the nerve trunk. The greatest variation on the left side was 4 mm. from the nerve center. The foramen ovale through which it emerged was but 3 mm. wide. This error would place the needle aperture 1.5 mm. from the nerve surface and is the only one in the 480 measurements made in which the needle aperture would not be within the nerve substance.

Of the injections that would be in the nerves, 20 per cent would be at the periphery instead of at their approximate centers. In three-fifths of these the aperture of the needle would be beyond the center—that is, toward the surface facing the nasopharynx—and in two-fifths the aperture of the needle would be short of approximate center.

Most technics heretofore described require penetration of the nerve trunk because they lack precision and therefore if the needle point were outside the nerve trunk the operator would not know where it was. In an injection of the inferior alveolar branch at the mandibular foramen the needle point need not be in the nerve because reasonable approximation affords the desired results.

If a single injection is to anesthetize the entire third division, the nerve must be approached at its cranial base. The landmark for this operation is the foramen ovale which is situated immediately behind the posterior end of the root of the lateral pterygoid plate. The long axis of the circumference of the foramen extends from this point backwards and outward so that its center is closer to the cheek than is its anterior commissure. The root of the lateral pterygoid plate is contiguous with the anterior margin or commissure of the foramen. The posterior end or commissure is about 10 mm. in back of and lateral to the anterior end. The foramen spinosum, transmitting the middle meningeal artery, is about 2 mm. in back of and in line with the long axis of the foramen ovale. The relationships of the nerve below the foramen ovale are important. Lateral to the nerve is the upper head of the external pterygoid muscle which arises from the infratemporal surface of the greater wing of the sphenoid. The needle passes through this muscle in the lateral approach to the mandibular nerve. The auditory tube beginning well behind the nerve passes downward, forward and medialward so that at about the middle of its course it lies on the medial side of the nerve. The relation between the nerve and the tube is close; the nerve touches on the anterolateral membraneous wall of the tube slightly below the level herein recommended for injecting the nerve. In front of the nerve is the root of the lateral pterygoid plate while behind it is the middle meningeal artery.

A variation in skeletal anatomy (involving the previously mentioned pterygoalar ligament) consists of a temporobuccal foramen, which, when present, develops by ossification of the ligament which bridges a shallow sulcus, anterior and lateral to the foramen ovale. In the sulcus, and held in place by the ligament, lies the beginning of the anterior deep temporal nerve, the first part of which is occasionally a trunk common to it and the buccinator nerve. When the ligament ossifies it gives rise to a variably thick bony bridge which tends to block a high lateral ap-

proach to the foramen ovale but which should not hinder entering the nerve at the selected position; that is, 6 mm. below the foramen ovale and thus below the ossified ligament. This variation was found to block completely entry into the foramen but not into the nerve in 2 per cent of the skulls examined by the authors. Chouke,[8] however, has found this anomaly in 8 to 10 per cent of the skulls he examined. This difference may be in that our 2 per cent included only completely ossified ligaments.

■ *Technic*

DEPTH OF INSERTION DETERMINED—Under completely sterile conditions the widest portion of the face is determined, its position is marked, the over-all head width is measured carefully and recorded, and the depth of insertion of the needle is determined and marked on the needle.

To accomplish these steps palpate the prearticular notch on the lower border of the zygomatic arch. This is ascertained by having the patient open and close his mouth to locate the condyle. The index finger will then feel the depression of the mandibular notch in front of the condyle and the tip of the finger should then rest in the concavity of the prearticular notch. A small dot is made with any antiseptic dye—such as methylene blue or iodine—on the arch just above the center of the finger tip. This should be about 3 cm. in front of the center of the external acoustic meatus. The width of the face is measured with calipers from the dot to the similar place on the opposite side of the face (Fig. 2, left). The determined width is recorded and divided by three. This measurement —that is, one-third of the total caliper measurement—is now marked on a 22 or 24 gage Leur type needle to be used for the injection.

POINT OF INJECTION IS DETERMINED—One end of an orangewood applicator, 3 or 4 cm. long, is wrapped with cotton, and that end is so placed in the external acoustic meatus that the other end points horizontally outwards. A second dot is placed 3 cm. directly forward of the orangewood stick (Fig. 2, right). This is the place selected for injection. It should be about 3 cm. in front of the center of the external acoustic meatus; 1 cm. below the widest part of the head (Fig. 3), the place where the first dot was made; 1 cm. in front of the lowest point of the eminentia articularis and, therefore, 1 cm. in front of the most direct approach to the mandibular nerve at a position corresponding to about 6 mm. below the foramen ovale; just below the center of the prearticular notch; at about the middle (anteroposteriorly) of the mandibular notch.

THE INJECTION—A surface injection is made at the position of the entrance. This is best done with an auxiliary syringe using 0.5 to 1 cc. of procaine.

The previously marked 3 inch needle, without the barrel attached, is now inserted to approximately the depth of the region anesthetized. The needle is directed horizontally toward the sagittal plane, with a backward inclination of

8. Chouke, K. S., Injection of the Mandibular Nerve and Gasserian Ganglion: An Anatomic Study. *Am. J. Surg.* 78:80 (July) 1949.

about 12 degrees. The backward inclination is to cause the point of the needle to arrive at the nerve at the time it reaches the depth of the mark made on the needle. The needle point thus passes horizontally medially for one-third of the width of the head and posteriorly to the extent of 1 cm. When the depth of the anesthetized region is reached the barrel is attached to the needle and additional anesthetic solution is injected. The barrel is removed and the needle is again advanced. This procedure—that is, barrel removal and advancing the needle—is repeated until the marked place on the needle reaches the skin surface, at which time the barrel is again added and 2 to 3 cc. of procaine is injected.

The point of entrance is 1 cm. in front of the straight horizontal line passing 1 cm. below the foramina ovalia and immediately beneath the eminentia articularis because a straight line approach, beginning immediately under the eminentia articularis, would place the needle in vulnerable tissues constituting the anterior elements of the temporomandibular articulation.

Because the face becomes narrower from the point of injection forward, there is an inclination to direct the needle point too far posteriorly; that is, at an angle greater than 12 degrees. If inserted at nearly right angles to the skin surface of the face, the needle will go nearly directly to the foramen.

■ *Indications for Extraoral Technic*

In most surgical operations in the region of the mandible it is necessary to anesthetize three separate branches of a

Fig. 2.—Left: Determining the widest part (the zygion) of the head. Right: The zygion and the place of injection are marked on the face

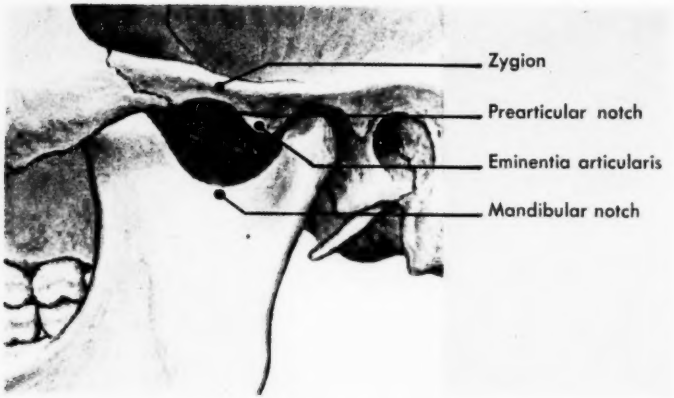

Fig. 3.—A lateral view showing the relationship of the mandibular notch, the zygion and the external acoustic meatus

third division of the trigeminal nerve. The foramen ovale technic accomplishes this with one injection.

In many instances anesthesia cannot be established by intraoral routes because access is temporarily or permanently suspended or the tissues are so affected by trauma or neoplasms that they cannot confine the anesthetic agent.

The technic outlined here will be useful to neurosurgeons for diagnostic and alcohol injections of the mandibular nerve for tic douloureux. There are many uses for it in the practice of oral surgery including:

1. Inaccessibility of the intraoral approach because of trismus from infection or trauma.
2. Extensive traumatic injury. (Its use in reducing multiple fractures of the mandible has been most gratifying.)
3. Extensive tumors or neoplasms.
4. In the presence of infection and inflammation of oral mucosa, for those who fear injecting into such tissues in the presence of these conditions.

■ *Caution*

Often, the simplicity of administration of local anesthetics is an incentive to carelessness which in turn invites complications. The injection of an anesthetic solution by the extraoral route should be considered as a surgical procedure and the basic principles of surgery must be rigidly followed. A natural immunity afforded in surgery within the oral cavity is absent when extraoral routes are used. The preparation of the skin and surrounding tissues at the site of injection must receive the same meticulous care as would the surface site of any major operation and all elements of a strict aseptic technic must be followed for this injection. It might be disastrous to carry bacteria on

the needle into deep tissues adjacent to the foramen ovale.

■ *Advantages of the Simplified Technic*

VARIATIONS IN SKULL MEASUREMENTS—Our investigations tend to prove that while variabilities are many and diversified, the relationships of the foramina ovalia to each other and to the closest skin surface are extremely constant when considered in proportion to head width.

INSTRUMENTS—Except for large and easily procurable calipers, only instruments normally found in the offices of the practitioner are needed.

PAIN—The technic can be used with or without sedatives. If used without, the pain experienced is similar to that of ordinary inferior alveolar block anesthesia.

By inserting the needle with the syringe detached a more delicate control of the needle is attained and patients' fear reactions are less because of the absence of apparent force in inserting and advancing the needle. If vessel puncture occurs it becomes evident immediately by the backward flow of blood through the needle.—*344 Fourteenth Street.*

■ Twelfth Congres Francais de Stomatologie

The twelfth French Congress of Stomatology will be held in Paris, during the first two weeks of October, 1951. The executive board consists of: president, Dr. Rene Vincent; vice-presidents, Dr. Vilenski and Dr. Carvallo; general secretary, Dr. P. Friez; treasurer, Medecin-General Ginestet.

Those planning to attend the Congress and particularly those wishing to contribute to the scientific program are requested to notify the general secretary as early as possible.

Address correspondence to Dr. P. Friez, 42 rue Notre-Dame de Champs, Paris 6, France.

Cooperation of oral surgeon and prosthodontist in rendering artificial denture service

■ *Luzerne G. Jordan, D.D.S., Washington, D. C.*

The paramount justification for the practice of dentistry is the health, comfort and welfare of the patient, and the remarks which I shall make in this discussion will be based upon this premise.

Complete cooperation between any two branches of a profession such as ours can result only when there is a complete understanding of the problems of each and a willingness on the part of each to aid the other in every manner possible.

The majority of oral surgeons with whom I have worked, in connection with the rendering of artificial denture service, have been cooperative and many have willingly changed certain practices of long standing when the benefits of such changes were demonstrated.

There is one feature of dental service which has been given too little attention, both in clinical and private practice. This pertains to the dental examination and the formulation of treatment plans for patients who will need artificial denture service.

I refer to this phase of dental practice because it is not uncommon for some prospective edentulous or semiedentulous patients to go directly to the oral surgeon before contacting the dentist who is to make their artificial dentures. In too many instances natural teeth are extracted without the patient being informed of the procedure which should be followed.

This practice does not coincide with modern concepts of artificial denture service and may, in some instances, contribute to the rendering of an inferior service.

Except in cases of accident or acute pathology, patients who are to receive artificial denture service should always be examined by the dentist who is to render that service before any operative procedures are decided upon or instigated. This is logical because artificial denture service is a very complex and exacting phase of dental practice in which the examination and treatment plan are vitally important factors.

Not unlike the builder who will be responsible for a finished structure, the prosthodontist is the one who has the long range responsibility of providing artificial denture service to the patient, and, as with a building, the foundation is one of the most important factors to be considered.

When the prosthodontist's examination and treatment plan is incorporated in the initial treatment plan it is possible that the resulting denture foundations will contribute to better artificial denture service for the patient and that the prestige of all who have participated in solving the

A topic discussion as part of a symposium, read before the Section on Full Denture Prosthesis and the Section on Oral Surgery, at the ninety-first annual session of the American Dental Association, Atlantic City, November 1, 1950.

patient's dental problem will have been enhanced.

There are other reasons why the prosthodontist should meet the prospective denture patient before any operative procedures are instigated.

A complete understanding on the part of the patient regarding the nature of artificial dentures and their many shortcomings, previous to the loss of his natural teeth, is one of the most important factors in the attainment of a successful end result. The mind plays an important part in acceptance and tolerance of artificial substitutes for portions of the human body, and the time to prepare the prospective edentulous patient for artificial dentures is previous to the loss of his remaining natural teeth.

Pre-extraction records constitute one of the best aids to the rendering of artificial denture service. These records are of inestimable value during original denture construction and later serve to show the patient the changes which have occurred as the result of edentulous ridge resorption. They also serve as a guide when relining old dentures and constructing new ones.

It is regrettable that the making of such records is not a routine procedure with all dentists who construct dentures for patients. This service is not the responsibility of the oral surgeon but of the prosthodontist, providing he is given the opportunity to render it.

Although pre-extraction records are usually associated with the construction and maintenance of artificial dentures, such records may prove to be of great value to dentists and to plastic surgeons in cases of facial mutilation.

I would suggest the name "profile and dental characteristics records" and that the first of such records be made by dentists early in the adult life of patients.

The dental examination for practically all patients who will require partial dentures and for many who will require full dentures should include the making of accurate study casts, and in many instances these casts should be mounted in an articulator.

Study casts not only reveal many conditions which may not be evident from a visual examination of the mouth but they may be used by the prosthodontist and by the oral surgeon in outlining their treatment plans and for explaining to the patient the reasons for certain proposed operative procedures.

Immediate artificial denture service, in which the surgical procedures are performed by one dentist and the prosthetic service by another, calls for complete cooperation on the part of both dentists if satisfactory end results are to be expected.

The primary concern in this branch of dental service relates to the reshaping of the osseous substructures contiguous to the remaining natural teeth that are being extracted and also to the use of sutures on the soft tissues.

Alveolectomy is not necessary in all cases and should be avoided when possible. Except in case of disease or injury the only reason for altering edentulous ridge form is to meet the requirements of prosthetics and the prosthodontist is best qualified to prescribe such alteration.

Conservation of the oral tissues should be the aim of all operators and surgical reduction of denture bearing areas should always be kept to a minimum.

After the prosthodontist has determined what if any alteration of ridge form is necessary and has established the desired form on the master cast he should make a duplicate cast to serve as a guide for the oral surgeon. An impression is made of the completely altered master cast after the boil out procedures have been completed in the laboratory and before the cast has been tin foiled.

The duplicate cast is made of artificial stone and may be used for making a transparent base to serve as a surgical guide. The oral surgeons with whom I cooperate are able to produce excellent results by observing the duplicate altered cast and, therefore, it is no longer necessary to construct transparent surgical guide bases.

It is the responsibility of the prosthodontist to furnish the oral surgeon with whatever guides may be necessary to enable him to form a ridge which will fit the denture.

The inner surface of an immediate denture should present a smooth and well rounded concave form so that it may serve as a suitable matrix for the formation of the edentulous ridge as it heals. The presence of projections which extend into tooth sockets interferes with the filling in of these areas during the healing process and they definitely accentuate resorption of the osseous substructures. In this regard the use of saddle type pontics in fixed bridgework results in less edentulous ridge resorption than the use of pointed root type pontics.

The improper use of sutures may have an undesirable effect upon artificial denture base extensions in the buccal and labial sulcus regions.

Deep buccal and labial sulci usually contribute favorably to denture base retention and stability because they permit the use of prominent buccal and labial denture flanges.

Surgical procedures, which may involve the use of sutures, should therefore, be designed to preserve the maximum normal depth of these sulci, especially in immediate denture service.

It is not uncommon for some oral surgeons to remove too much of the interseptal tissue over the crest of the ridge, and then bring the edges into apposition with tight suturing following alveolectomy. This procedure usually results in a shortening of the sulcus depth that was utilized when constructing the immediate prosthesis. This immediately sets up a condition of denture border overextension which can be detrimental to the comfort of the patient and to the prestige of both the oral surgeon and the prosthodontist.

Sutures may be used without shortening the vestibule depth if the oral surgeon will delay shortening the interseptal tissues until after the osseous structures have been reshaped and then remove only that portion which overlaps the undisturbed section while light finger pressure is being applied sulcus-wise in the vestibule region.

It is my opinion that sutures are seldom necessary under immediate dentures provided the patient can be depended upon to follow directions and providing the inner surface of the denture has been properly prepared to serve as a desirable matrix over the surgically altered areas. Some of the best formed ridges have resulted from using only the denture base to support the soft tissues during the healing process.—*1801 Eye Street, N.W.*

Cysts of the jaw bones

■ *James L. Bradley, D.D.S., M.S.D., St. Albans, L. I., N. Y.*

A cyst is a pathologic cavity lined by an epithelial sac which contains fluid or semisolid material. In the jaws, it may vary from a small apical area to a massive space occupying a great portion of the maxilla or the mandible (Fig. 1). Therefore, during an extensive hospital practice in oral surgery many ramifications of cystic conditions of the jaw bones may present themselves for diagnosis and treatment. This report presents a clinical, roentgenologic and histopathologic study of 104 developmental cysts derived from odontogenic and nonodontogenic tissues in 93 patients treated in the Naval Service. Neoplasms of dental origin, the ameloblastoma and odontoma, are not included in this report except for differential diagnosis.

There have been numerous classifications of cysts offered to the clinician;[1,2,3] however, Robinson[4] presented a working classification that has been a great asset to the oral surgeon, roentgenologist and pathologist. His classification is as follows:

I. Developmental cysts
  A. From odontogenic tissue
    1. Periodontal cyst
      (a) Radicular or dental root apex type
      (b) Lateral type
      (c) Residual type
    2. Dentigerous cyst
    3. Primordial cyst
  B. From nondental tissues
    1. Median cyst (median palatine cyst)
    2. Incisive canal cyst
    3. Globulomaxillary cyst

Waldron[5] classified cysts as epithelial odontomas.

The most commonly occurring cysts are the periodontal type often called radicular, radiculodental or dentoperiosteal cysts. They are usually found in the apical regions of pulpless teeth, sometimes marginally or as residual cysts (Fig. 2 and 3), depending on the focus of stimulus. The epithelial granuloma is a potential cyst and when an involved tooth is removed all of the affected tissue should be enucleated. Kronfeld[6] believed periodontal cysts could originate in two ways: (1) An abscess cavity in granulation tissue surrounding the root of the tooth may become lined with epithelium because of the inherent tendency for epithelium to cover raw surfaces. (2) Epithelial masses that had formed as a result of pro-

The opinions or assertions contained herein are the private ones of the author and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

Commander (D. C.), U. S. Navy, assistant chief of Dental Service and oral surgeon, U. S. Naval Hospital, St. Albans, Long Island, N. Y.

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3. Christiansen, G. W., Cysts of the Jaws. *J. Oral Surg.* 2:308 (Oct.) 1944.
4. Robinson, H. B. G., Classification of Cysts of the Jaws. *Am. J. Orthodont. (Oral Surg. Sect.)* 31:370 (June) 1945.
5. Waldron, C. W., Cystic Tumors of the Jaws: Conservative and Two Stage Operative Procedures to Prevent Deformity and Loss of Useful Teeth. *Am. J. Orthodont. (Oral Surg. Sect.)* 27:313 (June) 1941.
6. Kronfeld, R., *Histopathology of the Teeth and Their Surrounding Structures*, ed. 2. Philadelphia: Lea & Febiger, 1939.

liferation may themselves undergo cystic degeneration and be transformed into a cyst. Hill,[7] in a study of 131 granulomas found in 89 cut routinely, 35 per cent contained epithelium. Of 42 that were prepared serially, all contained epithelial tissue. Schlack[8] found 41.7 per cent of 103 periapical lesions contained epithelial tissue. He believed that epithelial tissue inclusions when stimulated might proliferate to produce cysts. He also emphasized that because of the frequency of occurrence periapical lesions should not be allowed to remain after tooth removal. It is commonly believed that the periodontal cyst develops from a proliferation of the "debris of Malassez," commonly found in the periodontal membrane.[9]

7. Hill, T. J., Epithelium in Dental Granulomata. *J. D. Res.* 10:323 (June) 1930.

8. Schlack, C. A., Rate of Occurrence of Epithelial Tissue in Periapical Lesions. *U. S. Nav. Med. Bull.* 42:158 (Jan.) 1944.

9. Malassez, M., Surle role desdebris epithelieux paradentaires. *Arch. de physiol.* 6:379, 1885.

Fig. 1.—Above: Small periodontal cysts in the apical region of pulpless teeth. Below: Massive dentigerous cyst occuying a great portion of the body of the mandible

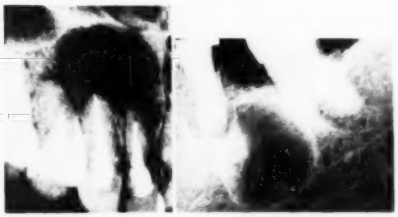


Fig. 2.–Periodontal cysts in the apical region of teeth with root canal fillings

Robinson[4] also classified cysts that are derived from epithelial remnants that were once associated with the periodontal membrane of deciduous teeth as periodontal cysts. Stafne[10] reported a cyst whose origin was from the interceptal bone which developed years after the loss of the deciduous teeth.

A dentigerous cyst develops within the jaws and usually contains the coronal portion of an unerupted tooth or dental structures (Fig. 4). It is lined with squamous epithelium derived from the enamel epithelium of the tooth follicle (Fig. 5). It is believed that there is a stimulus which causes an accumulation of excess fluid in the spaces of the stellate reticulum during the period of tooth development which causes cystic formation. It is also believed to be the result of degenerative changes in reduced enamel epithelium. These cysts may occur in single or multiple form. Masses which clinically and roentgenographically appear as dentigerous or primordial cysts may show definite ameloblastic properties (Fig. 6). Cahn[11] reported the membranes of these cysts occasionally have mural nodules that are histologically adamantinomatous. There have been reports that ameloblastomas have occurred at the site of operations for the removal of dentigerous cysts. There have been numerous reports in the literature of cases showing the transition of an odontogenic cyst to an ameloblastoma. It is possible that dentigerous cysts are one stage in the development of neoplastic lesions.

Primordial cysts, like dentigerous cysts, arise from amelogenic epithelium, but during the stage of histodifferentiation (Fig. 7). They contain no calcified structures. The primordial cyst has been called a follicular cyst; however, Robinson[4] suggested the term follicular be discarded as the epithelial content is involved and not the tooth follicle.

Cysts in the maxillary bones which arise from nonodontogenic tissue are the incisive canal cysts, globulomaxillary cysts and median palatine cysts (Fig. 8). They are also called fissural cysts and are believed to be caused by epithelial inclusions found in the region of embryonic

10. Stafne, E. C., Possible Role of Retained Deciduous Roots in Etiology of Cysts of Jaw. *J.A.D.A.* 24:1488 (Sept.) 1937.
11. Cahn, L. R., The Dentigerous Cyst is a Potential Adamantinoma. *D. Cosmos* 75:889 (Sept.) 1933.

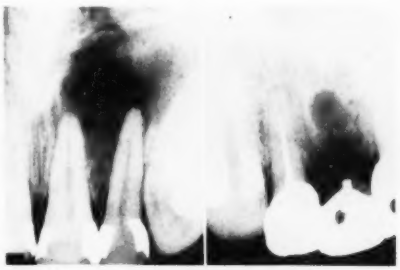


Fig. 3.–Periodontal cyst in the apical region of a nonvital maxillary central incisor and a residual cyst in an edentulous region.

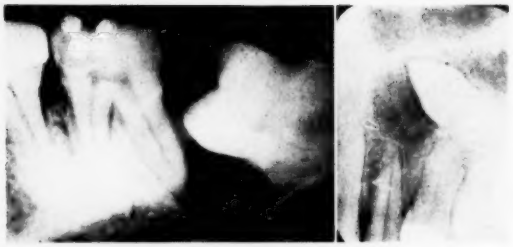


Fig. 4.—Left: Dentigerous cyst located around the crown of an impacted mandibular third molar. Right: Dentigerous cyst around the crown of an unerupted maxillary cuspid

processes of the maxilla. They are rare in the mandible. Consequently, they should be differentiated from odontogenic cystic growths.

The incisive canal cysts are found in the maxilla and cause an expansion of the incisive canal. They are believed to be caused by embryonal remnants.

Globulomaxillary cysts form at the junction of the globular and maxillary processes and are sometimes mistaken for periodontal cysts.

Median cysts are formed in the median line of the anterior part of the palatal sutures of the maxilla and are called median palatine cysts. Rarely are

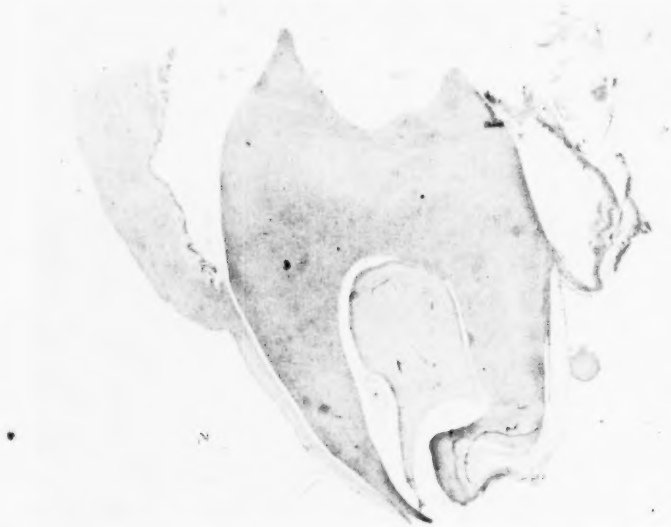


Fig. 5.—Dentigerous cyst attached to a third molar

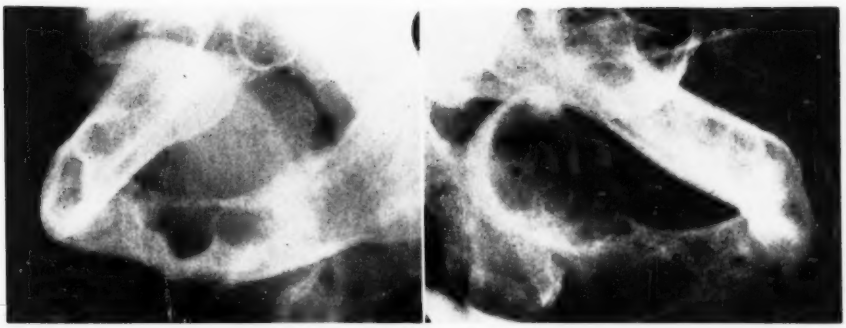


Fig. 6.–Left: Ameloblastoma in the mandible of a 61 year old woman. Right: Radiolucent area in the ramus with a scalloped border and honeycomb appearance, which was diagnosed as ameloblastoma

fissural cysts formed at the symphysis of the mandible.

These developmental cysts result from the proliferation of epithelial remnants after closure of communications between the nasal and oral cavities in fetal life. The most common site is in the incisive canal above the roots of the central incisors. These lesions rarely cause any symptoms and are usually found upon routine roentgenographic examination. They may be lined with ciliated squamous or transitional epithelium.

The traumatic or hemorrhagic bone cysts are important lesions because of differential diagnosis. They usually contain no definite epitheliated membrane and they are not expansive. They are usually associated with a definite history of trauma which is believed to have caused an intraosseous hemorrhage without fracture. These are also called extravasation cysts. They are found principally at the angle of the mandible and are rare in the maxilla (Fig. 9). A case seen recently consisted of a lesion at the angle of the mandible which was found upon routine roentgenographic examination of a 23 year old male. It consisted of a degenerated blood clot with some serous transudate, and apparently the internal pressure caused enlargement of the bony cavitation. Coley[12] describes solitary bone cysts of long bones which show roentgenographic and pathologic findings characteristic of this group.

One of the problems in diagnosis in oral surgery is to differentiate oral cysts from the numerous groups of neoplastic processes which appear as cysts roentgenographically. Amelobastoma which is derived from epithelium of the enamel organ type that does not actually form enamel is the most common. The roentgenogram may show cystic lesions of the unilocular or multilocular form. Other neoplasms that may resemble cysts of the maxillary bones that can be differentiated by laboratory and histologic examinations are:

12. Coley, B. L., *Neoplasms of Bone*. New York: Harper & Brothers, Inc., 1949.

squamous cell carcinoma, metastatic carcinoma, adenocarcinoma, central giant cell tumor, endothelial myeloma, fibrosarcoma and some of the mixed tumors of the salivary gland type. Osteodystrophies, which must be considered as multiple myeloma, osteitis fibrosa cystica and the xanthomatoses, may develop osteolytic defects that resemble cysts. Some inflammatory lesions that may appear cystic are syphilis, osteomyelitis, actinomycosis and eosinophilic granuloma of bone.

■ *Characteristics of Cysts*

The characteristics of cysts are slow growth, gradual osteolysis, which forms a definite cavitation, and eventual expansion of bone. Cysts may occur as single or multiple lesions. They may become so large as to cause asymmetry of the face. A gradual increase in swelling of the jaw may continue until the cortex of bone is so thinned that it presents a crackling sensation on palpation, and fluctuation at times may be elicited. They usually are attended by no discomfort unless the fluid or mass in the cyst cavity becomes infected. Pressure of the cyst upon a nerve may cause a direct or neuralgic type pain. Cysts that develop to a large size may weaken the jaw and cause a fracture by trauma. The leison may displace teeth in the arch and cause them to react negatively to vitality tests, but many regain their normal position and vitality after treatment. Size of the cysts may vary from a few millimeters in diameter to a massive growth occupying a great portion of the maxilla or mandible.

Cysts are usually surrounded by a

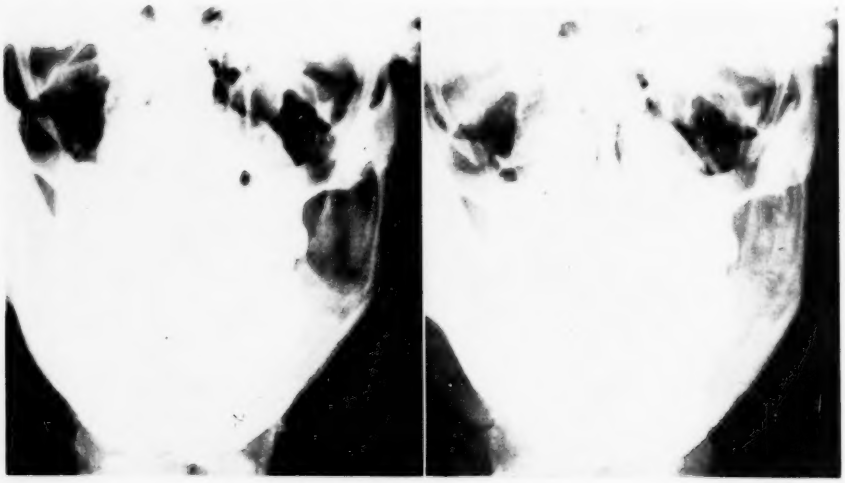


Fig. 7.—Left: Primordial cyst of the ramus. Roentgenogram taken October 11, 1948. Right: Defect packed with bone chips. Roentgenogram taken February 4, 1949

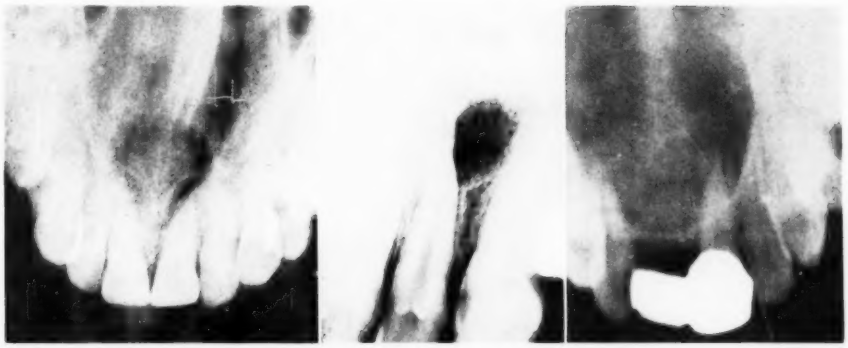


Fig. 8.—Left: Incisive canal cyst. The teeth were vital. Center: Globulomaxillary cyst. Right: Median palatine cyst

membrane of fibrous connective tissue. The inner surface usually is lined with simple stratified squamous epithelium (Fig. 10, left); however, cuboid, columnar, ciliated, or transitional epithelium may be present. There may be evidence of acute and chronic inflammation. The contents may be a serous, clear or amber colored fluid. They may contain cholesterol crystals (Fig. 10, right). In some cases the contents may be semisolid, thick and mucoid in character. In infected cysts the contents may contain bacteria, desquamated epithelial cells and pus.

■ *Diagnosis*

In a preoperative study of any cystic lesion possible neoplastic lesions of bone must be considered. Of first importance is an accurate history of the case. The symptoms should be listed in chronological order, stressing the accuracy and sequence of the symptoms. Important points in the stage of the present illness are pain, swelling, trauma and disability. It is important to record facts regarding previous illnesses and particularly those which give rise to bone lesions; for example, syphilis, osteomyelitis, actinomycosis and any previously treated malignant disease of any organ or system. A complete physical examination is essential, and inspection and palpation are extremely important.

The roentgenogram is the important

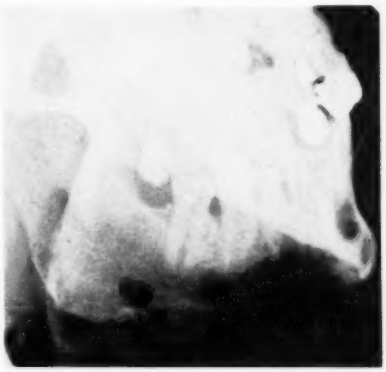


Fig. 9.—Traumatic cyst at the inferior border of the mandible

factor in a preoperative differential diagnosis of various cystic lesions. Skillful interpretation of the films will afford valuable information from which a presumptive diagnosis can usually be made. In a high percentage of cases a correct diagnosis may be determined.

In addition to intraoral exposures, extraoral and stereoscopic roentgenograms are frequently of great value. It is considered desirable to make an oblique exposure as well as the conventional posteroanterior and lateral views for it may yield additional information. Roentgenograms of the unaffected side or region should be made for comparison. The roentgen findings of a cystic region are usually characteristic: a radiolucent area, with a definite, even radiopaque line at the periphery, can be seen. This represents the compact layer of bone which surrounds the cyst membrane. The radiopaque line may vary according to the location of the cyst and the position of the teeth or other structures. An indefinite outline usually indicates inflammation.

The periodontal cyst is usually found in the periapical region of teeth and its subsequent extension may be recognized readily. Periodontal cysts that arise on the side of the tooth root are the lateral type. In edentulous regions may be found the residual type of periodontal cysts, which often contain root fragments or debris.

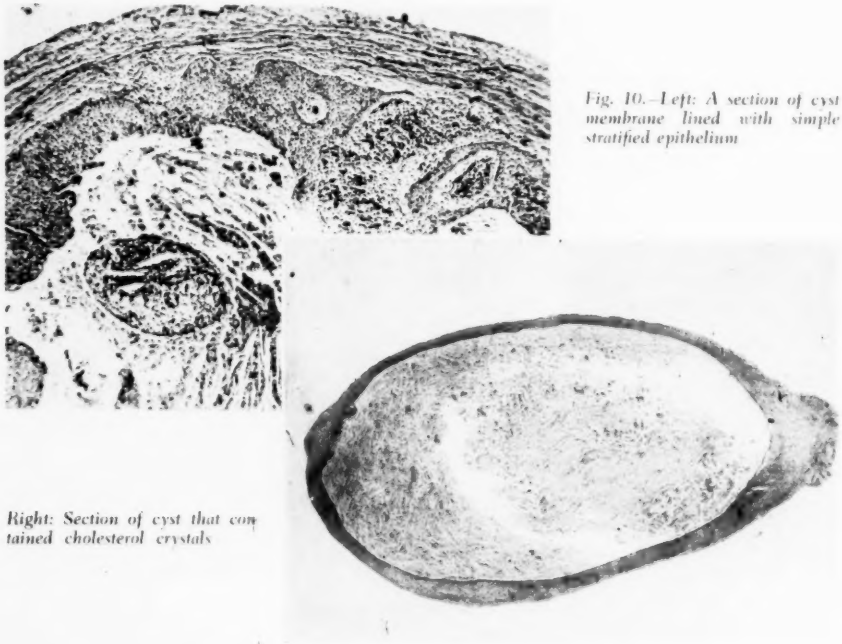


Fig. 10.—Left: A section of cyst membrane lined with simple stratified epithelium

Right: Section of cyst that contained cholesterol crystals

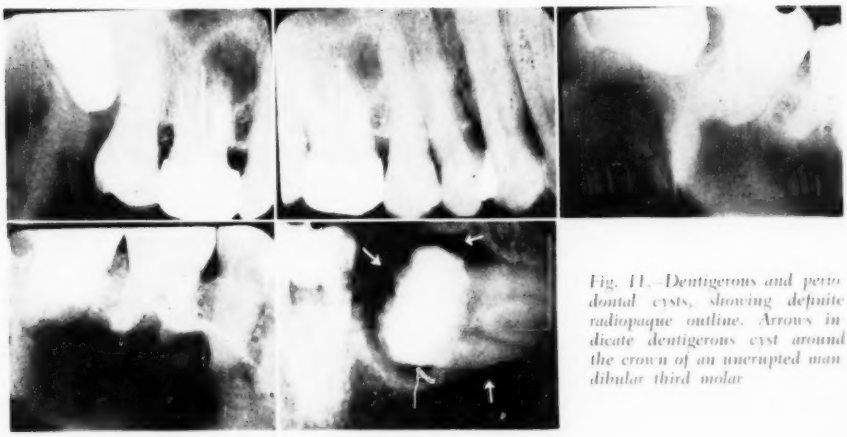


Fig. 11.—Dentigerous and periodontal cysts, showing definite radiopaque outline. Arrows indicate dentigerous cyst around the crown of an unerupted mandibular third molar

The dentigerous cyst is recognized by the fully or partially formed tooth included in the sac. (See Figure 11.) The pressure of the contents and the attachment of the cyst wall to the contained tooth may cause its displacement away from the line of occlusion. Primordial cysts must be differentiated from the residual type of periodontal cyst or tumor. They contain no calcified structures, and are most commonly found in the mandibular third molar region. They may occur in single or multiple form. The nonodontogenic cysts of developmental origin are found in definite locations. The median cyst is found in the median fissure of the maxilla and rarely in the mandible. They are usually away from the tooth bearing regions. Incisive canal cysts are found at the apical region of the maxillary central incisors. In edentulous areas they may develop to a relatively large size and are sometimes difficult to differentiate from a median cyst. When teeth are present, diagnosis is established if, on close inspection, the lamina dura is found to be intact and in normal relation to the teeth. A globulomaxillary cyst is differentiated from a periodontal cyst by its location between the maxillary cuspid and lateral incisor. Pressure usually extends the apical portion laterally.

In combination with roentgen examination an aspiration biopsy,[11] surgical biopsy,[12] or injection of a radiopaque substance,[13-15] may be used for differential diagnosis. To differentiate cysts from neoplastic disease aspiration biopsy is important (Fig. 12). Aspiration usually obtains sufficient histologic evidence to permit a diagnosis when supported by clinical and roentgenographic findings. If fluid is obtained the syringe may be exchanged and an equal amount of radio

13. Martin, H. E., and Ellis, E. B.: Aspiration Biopsy. *Surg., Gynec. & Obst.* 59:578 (Oct.) 1934.

14. Ennis, L. M.: Utilization of Radiopaque Solutions in Determining Final Interpretations of Oral Lesions. *J.A.D.A.* 19:918 (June) 1932.

15. Thoma, K. H.: The Use of Radiopaque Diagnostic Media in Roentgen Diagnosis of Oral Surgical Conditions. *Am. J. Orthodont. (Oral Surg. Sect.)* 27:64 (Feb.) 1941.

paque substance such as Lipiodol or Iodochloral is injected. After the needle has been withdrawn the hole should be closed by pressing on it with a sponge. The radiopaque substance will outline the cavitation in a roentgenogram (Fig. 13). This procedure is extremely important when a cyst lies close to or in the maxillary sinus and encroaches upon its floor or other boundaries, and no sharp line of demarcation is apparent. The injection of a radiopaque material followed immediately by roentgenography will yield much desired information. Surgical biopsy is an extremely important method of diagnosis in the differentiation of cysts from neoplasms. It should be the final step in investigation of suspected cases of bone tumors.

■ *Treatment*

The treatment of choice for cysts is surgical excision. After diagnosis has been established and the position and size of the cyst have been determined, treatment consists of exposure, drainage and partial or complete enucleation of the mass with removal of teeth if indicated. The relative location of a cystic lesion to other structures, such as teeth, maxillary sinus, nasal and orbital cavity, mandibular canal and adjacent soft tissue, must be taken into consideration when determining treatment.

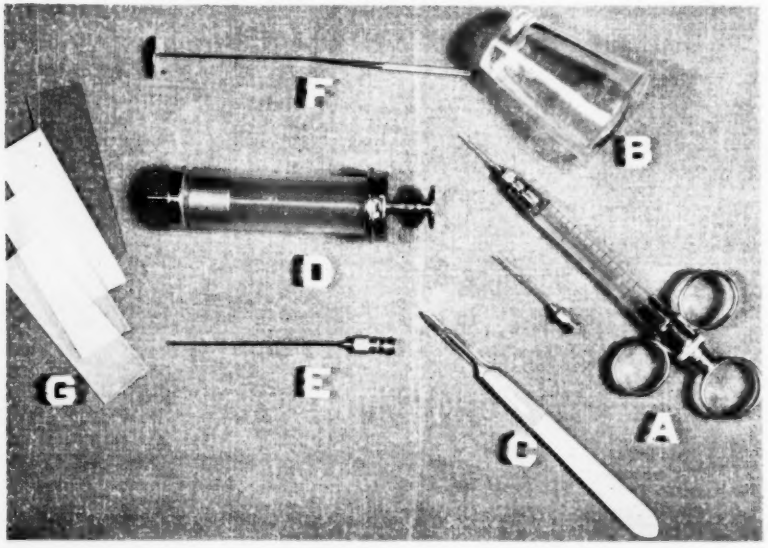


Fig. 12.—Aspiration biopsy armamentarium. A: Hypodermic syringe with long and short needles for procaine infiltration. B: Glass for procaine solution. C: Scalpel. D: Record syringe, 20 cc. E: Eighteen gage needle with obturator. F: Raking instrument. G: Glass slides for smears of aspirated material

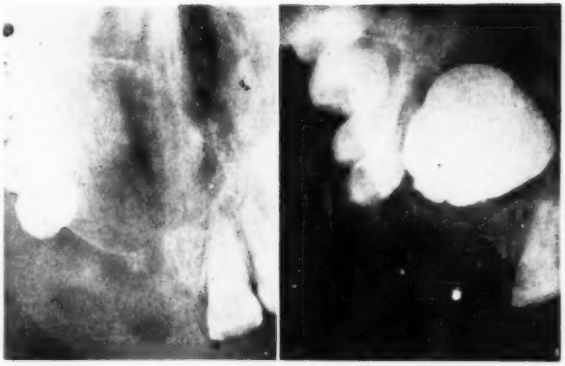


Fig. 13.—A large cyst area before and after the injection of a radiopaque substance

Some of the operations that have been successful in the treatment of cysts of odontogenic and nonodontogenic origin of the jaw bones are given.

Cystectomy is the surgical enucleation or excision of the membrane of a cyst, with primary closure. This operation may be successful for small cysts. A blood clot forms, and healing is by first or second intention. In larger cysts the lesion may be enucleated, and the wound allowed to close slowly. The defect will gradually diminish in size, being obliterated by granulation tissue, with development of normal surface epithelium and calcification of the cystic region. Extraction of teeth may be necessary; however, an apparently nonvital tooth may again respond to vitality tests after excision of the cyst. Condemned teeth may temporarily be left in position to act as a supporting structure during the healing period. The obliteration of large cysts with homogenous bone grafts has been successful. Bone grafts may spare the patient shock, morbidity and the necessity of a second operation.

A Caldwell-Luc operation is indicated for cysts that encroach on or extend into the maxillary sinus. The cyst membrane is excised and the wound closed. An antrostomy is extremely important to facilitate drainage.

Marsupialization, or the Partsch operation, is indicated for large cysts in which surgical removal would cause extensive mutilation or deformity. Care must be exercised in cases with possible ameloblastic nodules or other neoplastic characteristics, in which radical procedures must be instituted.

Healing is more rapid after complete excision of cysts than after marsupialization. Sometimes the defects are never completely eradicated.

Marsupialization may prevent exposure of the root ends of teeth, perforation of the maxillary sinus and injury to important nerves or vessels.

Apicoectomy is indicated for small cysts around the maxillary anterior teeth and in some mandibular anterior regions. With this technic the sac and the involved root tip can be removed. Apical

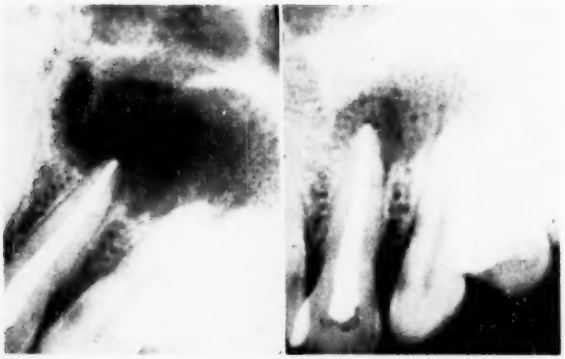


Fig. 14.—Left: Large maxillary cyst. Right: Nine months after treatment by apical curettage

curettage has been successful in numerous cases (Fig. 14). The root canal filling is overextended, and the cystic sac is removed. The excess material is then curetted, leaving the apex of the tooth.

Extraoral cystectomy is indicated in some large mandibular cysts, especially those found at the angle or inferior border of the mandible.

■ *Analysis of Data*

This study is based on 104 cysts of odontogenic and nonodontogenic origin of the jaw bones. Four patients had 2 cysts and one had 3 cysts. The lesions were classified as periodontal, dentigerous, primordial, cystic odontoma, incisive canal, globulomaxillary and median cysts. The cystic neoplasm, ameloblastoma, did not occur in this series.

The majority of cysts were of the periodontal type. Fifty-nine patients had a total of 67 cysts. One patient had 1 dentigerous and 2 periodontal cysts. One massive cyst involved the ascending ramus of the mandible. One periodontal cyst was found at the inferior border of the mandible.

In 48 instances, the root of the tooth in which the cyst had its origin was still present and in the other 19 instances, the region in which the cyst was found was edentulous. Approximate measurements were made at the mesial and distal diameter of the roentgenogram, and it was found that the average diameter was 1.7 cm. There were 88 males and 5 females in the study. The average age of the patients with periodontal cysts was 29.2 years.

Of the periodontal cysts 31 were found on routine roentgenographic study, 17 showed some evidence of swelling, 13 were accompanied by pain and soreness and only 6 revealed any evidence of a possible fistula.

The treatment was surgical. Thirty-four were treated by cystectomy (intraoral), with enucleation and primary closure, or packing open and with or without extraction. Three were treated by a Caldwell-Luc procedure; 1 by marsupialization; 11 by apicoectomy; 13 by apical curettage, 5 had incision and drainage done; 1 by partial marsupialization and enucleation. One unusual cyst was found on the inferior border of the mandible

and was treated by extraoral cystectomy.

There were 27 dentigerous cysts in 25 patients. Two of these were the primordial type found without any associated calcifications or dental structures. The average age of these patients was 25.5 years. Approximate measurements were made at the mesial and distal diameter of roentgenograms and the average size for the series was 2.1 cm.

There were 12 dentigerous and 2 primordial cysts found in the mandibular third molar region; 5 in the maxillary cuspid region; 3 in the maxillary molar region; 2 in the mandibular bicuspid region; and 1 each in the mandibular cuspid region, body of the mandible and ramus of the mandible.

Of the dentigerous and primordial cysts, 11 were found on routine roentgenographic examination; 9 revealed evidence of pain and swelling; 3 had an associated pericoronitis; 2 revealed looseness of teeth; 1 was accompanied by a long-standing neuralgia; 1 was associated with asymmetry of the face.

The treatment was surgical. There were 11 cystectomies with extraction and primary closure, and 12 cystectomies with enucleation, extractions and packing open. Two were treated by marsupialization with extraction of the involved teeth; 1 by marsupialization and 1 by the two stage procedure as described by Waldron.[3]

In this series there were 4 cystic odontomas all of which contained calcified remnants of dental structures. Two were found in the maxillary cuspid region; 1 in the mandibular bicuspid region and 1 associated with the maxillary lateral incisor. Two were found on routine roentgenographic examination and 2 caused a swelling of which 1 discharged a serous fluid. They all were treated by surgical excision.

Of the fissural cysts of nonodontogenic origin, 1 median palatine cyst was found. The only symptom was a bulging of the palatal mucosa. It was treated by enucleation and packing open. One questionable globulomaxillary cyst was found on routine roentgenographic examination. The involved teeth were vital. There were 4 incisive canal cysts, 2 of which were found in edentulous jaws. Three were found on routine roentgenographic examination, and 1 in an edentulous region showed a bulging under a denture with a fistulous discharge of a heavy mucoid substance. They all were treated by cystectomy.

■ *Comments*

The majority of cysts found in this study were of the periodontal type; next in frequency were the dentigerous, incisive canal, cystic odontoma, primordial and the relatively rare median palatine and globulomaxillary types. The periodontal cysts usually develop as a result of a proliferation of epithelium in chronic inflammatory conditions, such as the granuloma.

Dentigerous and primordial cysts are formed from the enamel organ epithelium of the dental follicle. Dentigerous cysts are always formed about the coronal portion of unerupted teeth. Primordial cysts are formed through degeneration of the stellate reticulum prior to or during histodifferentiation. Cystic odontomas contained calcified dental structures. The clinician should always consider the dentigerous and primordial cysts as potential

ameloblastomas. Therefore, a preoperative biopsy may be essential to detect ameloblastic or other neoplastic tissue which may determine the type of surgical procedure necessary.

Fissural cysts are relatively rare and are sometimes difficult to differentiate from odontogenic cysts if they are large or if the teeth have been lost.

The rate of growth of cysts of the jaw bones is apparently slow; however, maximal growth is not reached until the cortical plate has been perforated.

A radiolucent area that is spherical in shape usually indicates the roentgenographic image of a cyst. The periphery is usually a well defined radiopaque outline because of the sclerosis of the adjacent bone. When the roots of a tooth and the alevoli are involved the lamina dura usually cannot be seen. In infected cysts the radiopaque outline is irregular and at times will partially blur and obscure the outline of the cyst. Neoplastic tissues will cause denudation of the apical region of involved teeth; however, pressure of the cyst may displace a tooth and sometimes cause pressure resorption. Injection of a radiopaque substance is a great aid in the differentiation of a cyst from a solid neoplasm. The tendency for the occurrence of multiple cysts is found in a few instances.

Every specimen of cystic tissue removed should be submitted for pathological study to verify the diagnosis. This is essential in connection with the marsupialization technic, because neoplastic tissue would require a more radical operation.

A cystectomy, in which enucleation with primary closure or packing open is the treatment of choice, usually reduces the period of convalescence and hospitalization. This may require the extraction of involved teeth; however, apicoectomy and apical curettage provide gratifying results in the anterior region. Marsupialization must be used with caution. The treatment of surgical wounds terminates only when complete healing has been achieved. All precautions, as wound and oral hygiene and systemic chemotherapy, must be utilized to control secondary infection and promote healing.

■ *Conclusions*

One hundred and four consecutive cysts of the jaw bones occurring in 93 patients are reported.

Correct diagnosis is sometimes difficult but can be established by standard laboratory and clinical methods.

Nonvital teeth that extend into cystic cavities should not be condemned and removed at the time of the operation. Many teeth regain their vitality as healing progresses.

Lesions that simulate cysts must be considered in a differential diagnosis.

An automatic vertical angulation meter for periapical and occlusal roentgenography

■ *Albert G. Richards, B.S., M.S., Ann Arbor, Mich.*

In dental roentgenography the vertical angulation of the x-ray beam determines whether the roentgenographic images on the film will be foreshortened, elongated or of correct length. For teeth with multiple roots and cusps, the vertical angulation determines whether or not the vertical displacement of the roentgenographic images of the lingual and buccal apexes and cusps will be normal (Fig. 1). It is the purpose of this paper to report on a vertical angulation meter which is used to determine accurately and automatically the correct vertical angulation of the x-ray beam for all periapical and occlusal roentgenograms.

Since the advent of dental roentgenography, many methods and devices have been contrived to furnish information about vertical angulation. In 1907, Cieszynski[1] formulated his "rule of isometry," which in recent years has become known as the "bisecting rule." In this technic the central ray of the x-ray beam is directed at the apex of the tooth and perpendicular to an imaginary line which bisects the angle formed by the plane of the film packet and the long axis of the tooth. Another method which furnishes vertical angulation values could be called the "method of averages." With this method, each region of the mouth is assigned an average vertical angulation value (determined through trial and error) which is expected to result in satisfactory roentgenograms in the majority of the cases, provided the patient's head is positioned in a "standard position." Some mechanical vertical angulation aids have been devised, with varying degrees of success.[2]

The theory on which this new vertical angulation meter is based can be explained with the aid of Figure 2. In this illustration angle A is measured between the long axis of the tooth and the plane of the film packet. The bisector line divides angle A into two equal parts. Angle B measures the inclination of the plane of the film packet relative to a vertical plane. Angle C is the vertical angulation value determined by the bisecting rule. It can be determined mathematically that angle C equals angle B minus one-half angle A. This relationship is the basis on which the meter operates. The meter is used by positioning it at the side of the patient's face with the straight edge of the meter's case visually aligned parallel with the plane of the film packet. This operation pro

Assistant professor of dentistry, School of Dentistry, University of Michigan, Ann Arbor, Mich.

1. Cieszynski, A.: Ueber die Einstellung der Roentgenrohre bei Zahnaufnahmen. Neue Hilfsapparate. *Korr. f. Z.* H.2:158, 1907.

2. Kaletsky, Theodore: A Simple Way to Produce Consistently Accurate Intraoral Roentgenograms and a Modification of the Technic of Dental Roentgenography. *J.A.D.A.* 26:390 (March) 1939.

Fig. 1.—Foreshortened (A), normal (B) and elongated (C) tooth images resulting from vertical angulation values which were too high, correct and too low, respectively. Note variation in vertical displacement of the apexes and cusps in each instance.

vides the meter with the quantity, angle B. The movable arm of the meter is then aligned parallel with the long axis of the tooth. This second operation provides the meter with the quantity, angle A. The meter then divides angle A by two, subtracts the quotient from angle B and would indicate the difference on the dial as angle C, which would be correct to fulfill the conditions of the bisecting rule. But since it is not convenient to direct the central ray of the x-ray beam at the hidden apex of the tooth, an additional small angle, angle D, is added to angle C to compensate for directing the central ray at a visible target, the gingival margin of the tooth, rather than the hidden apex. The actual vertical angulation setting indicated on the dials of the meter is then the sum of angles C and D.

With the aid of the meter, production of periapical roentgenograms is accomplished in three easy steps. (1) The meter is held in a vertical position near the patient's mouth with the edge of the case visually aligned with the plane of the film packet and the movable arm of the meter aligned parallel to the long

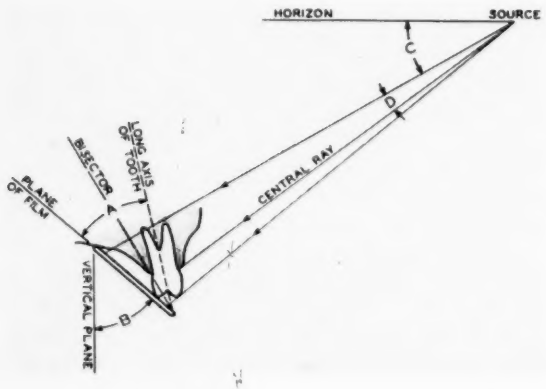


Fig. 2.—Illustration of the theory on which the meter is based. Angle B minus one-half of angle A equals angle C. Angle C plus angle D equals the value indicated by the meter.

axis of the tooth under investigation (Fig. 3, *A* and *B*). The reading of the meter then is noted. (2) The x-ray unit is adjusted in accordance with the information given by the meter (Fig. 3, *C*). (3) The central ray of the x-ray beam is directed at the gingival margin of the tooth and the exposure of the film is completed (Fig. 3, *D*).

The inclination of the long axes of the teeth always will be conjectural because the roots of the teeth are hidden in the alveoli. However, a knowledge of dental anatomy and a careful visual examination of the bony supports of the teeth reduce the uncertainty of root inclination to a minimum. The small amount of uncertainty about the inclination of the long axes of the teeth is reduced 50 per cent further through application of the mathematical formula upon which the meter is based. An ex-

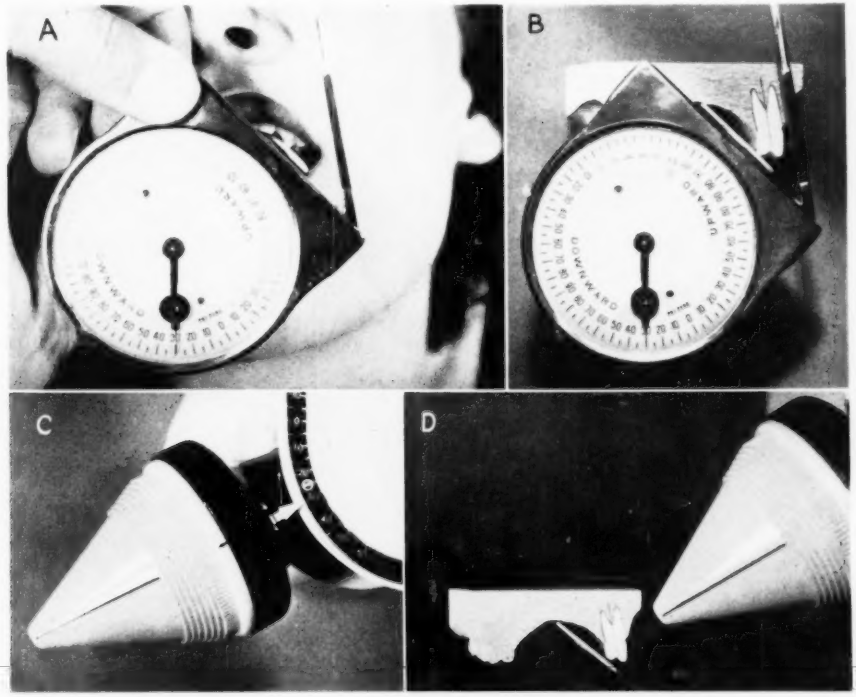


Fig. 3.—A: Meter is held in a vertical position near the patient's mouth. B: Edge of the case is aligned visually with the plane of the film packet, and the movable arm of the meter is aligned parallel to the long axis of the tooth. C: Vertical angulation of the x-ray beam is set in accordance with the information given by the meter. D: X-ray unit is positioned so that the central ray, whose path is indicated by the black line on the cone, is directed at the gingival margin of the tooth.

ample will help to clarify this reduction of human uncertainty. If the arm of the meter were inadvertently aligned six degrees incorrectly from the true long axis of the tooth, the operator's error would be reduced 50 per cent by the meter to a three degree error in the final adjustment of the x-ray unit.

No longer is a standard head position necessary when the meter is utilized. The patient could be in a supine position or seated upright in a chair and the proper vertical angulation would be indicated in each case. The long axis of the tooth under investigation can be inclined any amount lingually or buccally, the only qualification on the position of the patient's head being that the buccolingual

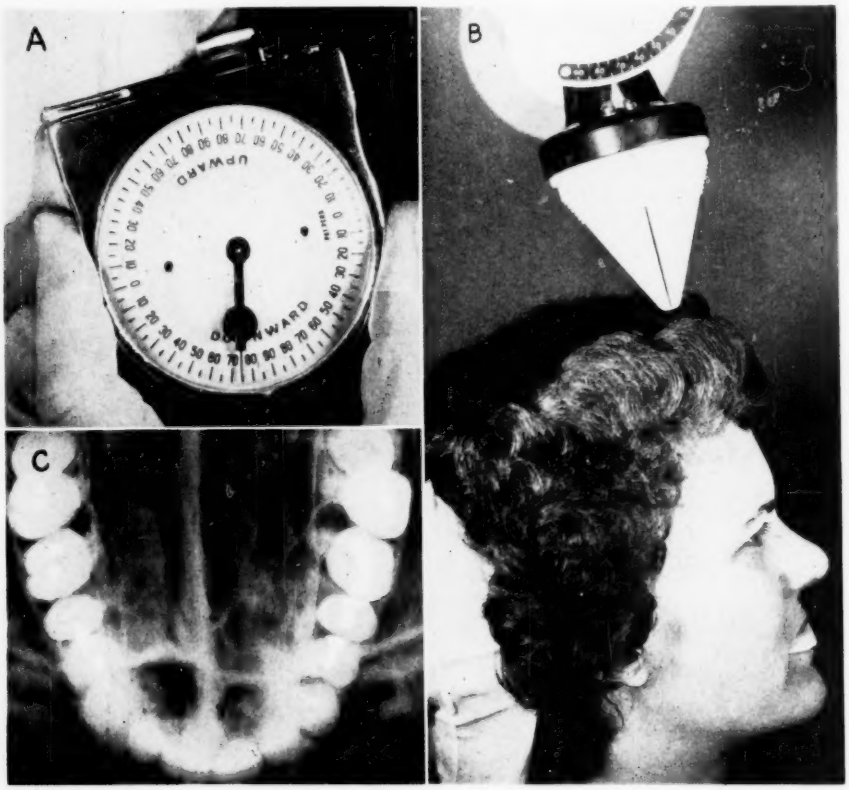


Fig. 4.—A: Arm of meter is closed, meter is held vertically beside patient's mouth and its arm is aligned with the edge of the occlusal film. B: X-ray unit is set at the value indicated by the meter, with the central ray directed at the center of the film. C: Resulting maxillary topographical occlusal roentgenogram.

plane of the tooth must be vertical. This one simple qualification is easily met, even in stretcher cases, merely by having the patient turn his head to one side or the other, depending on the region being roentgenographed.

The vertical angulation values indicated by the meter will yield correct tooth length when the central ray of the x-ray beam is directed at the gingival margin of the tooth. This desirable feature of having a definite, easily seen landmark at which to direct the x-ray beam is not always appreciated, because the importance of the exact point of entry for the central ray is not generally realized. When operating with an eight inch focal-film distance, as much roentgenographic distortion would result from changing the point of entry of the central ray from the root apex to the incisal edge as would be introduced by a five degree change in vertical angulation.

No part of the meter ever is placed within the patient's mouth. The case of the meter can be cleaned with soap and a damp cloth.

The meter can be used in conjunction with any method of film retention which permits visualization of the plane of the film and the teeth under investigation. Roentgenograms of all regions of the mouth are improved by use of the meter. For multiple rooted teeth, such as maxillary molars, the arm of the meter would be positioned not along the lingual or buccal root axes, but along a compromise between these two directions, if only one roentgenogram were to be made of the tooth. If, however, separate roentgenograms were desired of the lingual and buccal roots, the arm of the meter for one exposure would be aligned along the axis of the lingual root and for the second along the buccal axes.

The meter is as valuable for occlusal roentgenograms as it is for periapical views. For occlusal surveys which depict the teeth with proper length, the meter is utilized in exactly the same manner as for periapical views. For topographical occlusal surveys, the arm of the meter is closed against the case, the meter is held vertically beside the patient's mouth and the arm is aligned with the edge of the occlusal film (Fig. 4, *A*). The x-ray unit is set at the value indicated by the meter with the central ray directed at the center of the film (Fig. 4, *B*). The occlusal roentgenogram is shown in Figure 4, *C*.

The meter has been in use and tested for six years and has proved to be a valuable substitute for experience and a time saver in eliminating the prevalent need for retakes. Its use provides superior roentgenograms for easier and more dependable diagnoses.—524 *Linden Street*.

Anesthesia for office oral surgery with a clinical evaluation of thiamylal sodium

■ *Harry M. Seldin, D.D.S., New York*

All anesthetic drugs are poisons and they all can be death dealing in inexperienced hands. The dentist who wishes to employ a general anesthetic in his office should first become a qualified anesthetist, or he should employ a trained anesthetist. The possession of an anesthetic apparatus does not make one an anesthetist, nor does it give him the moral right to gamble with human life.

The dental profession is in great need of postgraduate courses in general anesthesia and dental colleges and hospitals are obligated to provide these courses.

The old dictum of heavy anesthetic doses is no longer valid. The modern anesthesiologist realizes that the safety of any anesthetic agent depends upon the use of minimal doses. The vast majority of dental patients will take a surprisingly high percentage of oxygen with nitrous oxide. For the overstimulated patient the nitrous oxide-oxygen can be supplemented with a heavier anesthetic such as vinyl ether, trichloroethylene, ether or intravenous barbiturates such as thiamylal sodium (Surital) or thiopental sodium (Pentothal). Combining anesthetic agents avoids overdosing the patient with nitrous oxide, permits a high percentage of oxygen and makes for safety in dental anesthesia.

To most patients, anesthesia and surgery are frightening experiences that may lead to emotional disturbances.

Raginsky[1] demonstrated that with a proper psychological approach anoxemia during anesthesia can be reduced greatly; conversely, under identical conditions, anoxemia can be increased by using a wrong psychological preparation of the patient.

A gentle and considerate attitude by the surgeon, anesthetist and nursing staff, the avoidance of confusion, and the prevention of unnecessary display of surgical instruments together with proper suggestion and assurance will reduce the secretion of epinephrine and make the anesthesia and recovery more pleasant.

Fear of the unknown, fear of dental surgery, fear that the anesthesia may go wrong or that the surgeon will start operating before the patient is asleep may cause an increased discharge of epinephrine with resultant cardiovascular irregularities and a decrease in coronary flow.

Reassurance on the part of the surgeon and anesthetist will greatly lessen these physiologic changes.

■ *Selection of Anesthetic Agent*

The anesthetic agent must be chosen to suit the patient. Different types of patients will require different forms of anes-

1. Raginsky, B. B., Mental Suggestion as an Aid to Anesthesia. *Anesthesiology* 9:472 (Sept.) 1948.

thetics. Patients usually can be divided into three groups: normal; subnormal or debilitated (anemic, cardiac); resistant or overstimulated. For the normal individual, and for short operations, there is no safer or better anesthetic than nitrous oxide-oxygen. The patient with well compensated heart disease, showing no undue shortage of breath, will tolerate nitrous oxide-oxygen like a normal individual. Prolonged nitrous oxide-oxygen anesthesia will often cause postanesthetic depression and nausea. Thiopental sodium or thiamylal sodium as a basal anesthetic in conjunction with nitrous oxide-oxygen, using a minimum of 50 per cent oxygen, is preferable to nitrous oxide-oxygen alone for prolonged surgical procedures in office oral surgery. With this combination there is less postanesthetic depression and rarely any nausea.

The subnormal patient will often not exhibit any of the classic signs of hypoxia, and may gradually slide into severe anoxia culminating in respiratory depression, then respiratory arrest. These patients cannot tolerate oxygen want and require a very high percentage of oxygen in the anesthetic mixture. The old dictum "if in doubt give oxygen" holds good with all patients, especially subnormal ones.

For the subnormal individual, a local anesthetic is desirable. If a general anesthetic is indicated and the operation is short, nitrous oxide with a high percentage of oxygen is safe. In prolonged office oral surgery thiamylal sodium, 0.4 per cent, or thiopental sodium, 0.4 per cent, by continuous intravenous drip, plus nitrous oxide, with a minimum of 50 per cent oxygen, is the anesthetic of choice.

The resistant type of patient presents a different problem. These individuals may resist any anesthetic agent, especially nitrous oxide, which is a comparatively mild anesthetic drug. In order to anesthetize them, their blood and tissues must be saturated with the anesthetic. Secondary saturation with nitrous oxide is dangerous and should not be employed.

The resistant patient can best be anesthetized by using a more potent drug as a basal anesthetic to the nitrous oxide-oxygen, thus producing a balanced anesthesia.

The following can be employed as a basal anesthetic with nitrous oxide-oxygen: trichloroethylene; vinyl ether; ether; thiopental sodium; thiamylal sodium. Any of these drugs combined with nitrous oxide-oxygen make for safety and are especially indicated for the robust and other resistant patients.

■ *Intravenous Barbiturates*

There has been, in recent years, a shift to the use of intravenous barbiturates as an anesthetic for ambulatory patients. In 1946 I made a survey among the members of the American Society of Oral Surgeons as to the safety of anesthetic agents in office oral surgery, which showed that only 37 members employed intravenous thiopental as an anesthetic in their offices. A survey made in 1950, by the Research Committee of the American Society of Oral Surgeons, under the chairmanship of J. Holden Beckwith, revealed that 137 oral surgeons use intravenous anesthesia in the office or hospital, and 93 use intravenous anesthesia in their offices; a substantial increase in the past four years. They conclude the report, "We sincerely feel that Sodium

Pentothal is the safest, the smoothest and most gratifying anesthetic to the patient that we have observed for use by oral surgeons."

I have employed three intravenous barbiturates in my office: thiopental sodium (Pentothal Sodium); pentobarbital sodium (Nembutal Sodium); thiamylal sodium (Surital Sodium). For the ambulatory patient thiopental sodium with nitrous oxide-oxygen produces an excellent anesthesia. At times the recovery period is rather prolonged. Respiratory depression, pharyngeal and laryngeal reflex spasms must be guarded against.

Pentobarbital sodium has the advantage of coming prepared, ready for use. It has the disadvantage of being a longer acting agent than thiopental sodium, with a resulting prolonged and protracted recovery period. Though it makes a good intravenous anesthetic for hospital surgery, it is inferior to thiopental sodium or thiamylal sodium for use as an office anesthesia.

Thiamylal sodium is a new intravenous anesthetic agent. Rovenstine and associates have used it in over 6,000 hospital anesthesias and have found it to produce an excellent anesthesia. Rovenstine and others[2] state that "Sodium Surital as used here has given more satisfactory results than had been experienced with previously used techniques." They have found that thiamylal solutions can be kept for as long as 14 days without apparent loss of potency or change in appearance.

I have used thiamylal sodium as a basal anesthetic with nitrous oxide-oxygen in over 200 prolonged surgical procedures. The results thus far have been excellent, and the balanced anesthesia thus produced is my anesthetic of choice in prolonged surgical procedures.

Thiamylal sodium is a potent, smooth, short-acting intravenous anesthetic. It is about 1.5 times as potent as thiopental and consequently smaller doses are required. Induction is accomplished by slow, intermittent injection of 1 cc. fractions of thiamylal, or by continuous intravenous drip. For office oral surgery, the maximum dose is 1 Gm., or 50 cc. of 2 per cent solution and 250 cc. of the 0.4 per cent solution. Dr. Rovenstine has used as much as 3.5 Gm. without severe depression. After an initial injection of 4 to 10 cc. of 2 per cent solution, or infusion of 30 to 50 cc. of 0.4 per cent solution, anesthesia occurs within 20 to 60 seconds. Anesthesia is maintained with nitrous oxide-oxygen and fractional doses of 1 cc. thiamylal as indicated. Oxygen percentages of at least 50 per cent are used. When the operation is about completed, the thiamylal is discontinued and the anesthesia maintained on nitrous oxide-oxygen.

I have not as yet noticed any tendencies toward laryngospasm and have had but one case of moderately severe respiratory depression. Rovenstine and his coworkers[3] have found that laryngospasm and respiratory depression are much less frequent with thiamylal than with any other intravenous anesthetic. Recovery is rapid; most patients can assist themselves out of the chair to the wheel chair soon after surgical procedures and they need

2. Helrich, M., Daly, J. F., and Rovenstine, E. A., The Anesthetic Management of Infants and Children During Endoscopy. *Pediatrics* 6:625 (Oct.) 1950.

3. Helrich, M., Papper, E. M., and Rovenstine, E. A. Surital Sodium, A New Anesthetic Agent for Intravenous Use. Preliminary Clinical Evaluation. *Anesthesiology* 11:33 (Jan.) 1950.

Table
Summary of data obtained from 100 cases in which a 2 per cent solution of thiamylal sodium was used with nitrous oxide-oxygen

Induction time	Amount of solution for induction	Duration of anesthesia	Total amount of solution used	Blood pressure, respiration, pulse	Oxygen percentage	Sex		Age
						Male	Female	
1-2 min.	3-10 cc.	5-50 min.	5-25 cc.	No significant change	25-75%	33	67	6-71 years

comparatively little attention. There is no nausea or other undesirable postanesthetic reactions.

Woods and others,[4] in a study of the cardiotoxic effect of thiobarbiturates, have found that in equivalent doses thiamylal is somewhat less toxic than thiopental. In excessive doses, intravenous thiobarbiturates produce, at first, respiratory depression culminating in respiratory failure. Barbiturates are detoxified in the liver and their use is contraindicated in severe hepatic diseases. Barbiturates are contraindicated in asthmatic patients because of their constricting action on the bronchioles. Being a respiratory depressant, their use is precluded in extensive swelling and infection of the floor of the mouth and neck. A free airway must be maintained at all times.

Following is a summary of data obtained from 100 cases in which a 2 per cent solution of thiamylal sodium was used together with nitrous oxide-oxygen. (See Table.)

One patient with a history of nausea following nitrous oxide-oxygen anesthesia had no nausea following nitrous oxide-oxygen and thiamylal.

Two patients who were obstreperous under nitrous oxide-oxygen anesthesia were relaxed during anesthesia with nitrous oxide-oxygen and thiamylal.

The types of operations performed included alveolectomy, multiple extractions, removal of impacted teeth, cystectomies, apicoectomies and removal of salivary calculi.

In the last 100 cases I have used 0.4 per cent thiamylal sodium in sterile isotonic sodium chloride solution by continous intravenous drip supplemented by nitrous oxide-oxygen. It is safer and more satisfactory than the stronger solution. It is an ideal anesthetic for the ambulatory patient, and obviates postanesthetic depression and nausea.

■ *Treatment of Emergencies*

The unfortunate situation of being faced with an anesthetic death may confront any dentist doing extensive surgery under general anesthesia. After respiratory failure, circulatory arrest may be caused by cardiac standstill or ventricular fibrillation.[5]

4. Woods, L. A., Wyngaarden, J. B., Rennie, B., and Seevers, M. H.: Cardiovascular Toxicity of Thiobarbiturates; Comparison of Thiopental and 5-Allyl-5-(1-Methylbutyl)-2-thiobarbiturate (Surital) in Dogs. *J. Pharmacol. & Exper. Therap.* 95:328 (March) 1949.

5. Lampson, R. Starr, Schaeffer, W. C., and Lincoln, John R.: Acute Circulatory Arrest. *J.A.M.A.* 137:1575 (Aug. 28) 1948.

As soon as respiratory failure and circulatory arrest become apparent, the immediate restoration of oxygen and circulation are imperative. Burstein[6] has shown that intravenous procaine hydrochloride reduces the acute arrhythmias during anesthesia. Procaine, 5 to 10 cc. of 1 per cent solution intravenously, is effective for ventricular fibrillation. For cardiac standstill 1 cc. of 1:1,000 dilution of epinephrine administered intravenously or directly into the heart is indicated. When circulatory arrest occurs it is almost impossible to differentiate between cardiac standstill and ventricular fibrillation. The drugs of choice to restore cardiac function are, therefore, the prompt intravenous administration of 9.5 cc. of 1 per cent procaine hydrochloride and 0.5 cc. of 1:1,000 dilution of epinephrine. If unsuccessful, any of the following drugs should be tried:

1. Epinephrine, 1:1,000, injected into the heart (1 cc.).
2. Metrazol, 2 or 3 cc., intravenously followed by 1 cc. intramuscularly when necessary.
3. Caffeine sodium benzoate, 1 cc. intramuscularly.
4. Aminophylline.

■ *Summary*

The ideal general anesthetic for office oral surgery as yet has not been discovered. However, to date, nitrous oxide-oxygen is the best anesthetic for the average patient for simple extractions and other surgical procedures of several minutes duration.

The overstimulated patient requires a more potent agent as a basal anesthetic with the nitrous oxide-oxygen.

A new anesthetic agent, thiamylal sodium (Surital Sodium), produces an ultrafast and pleasant induction. Both nitrous oxide and thiamylal sodium are mild anesthetics; yet, when combined, they produce an excellent balanced anesthesia with small doses of each and a high percentage of oxygen. It is especially indicated as a basal anesthetic with nitrous oxide-oxygen for prolonged surgical procedures. The combined anesthetic produces fine results in the patient who is a poor risk as well as in obstreperous patients. Thiamylal sodium certainly merits further clinical trial.—57 *West Fifty-seventh Street.*

6. Burstein, C., Treatment of Acute Arrhythmias During Anesthesia By Intravenous Procaine. *Anesthesiology* 7:113 (March) 1946.

■ Antiseptics

"The antiseptic is always injurious in its own action; a necessary evil, incurred to attain a greater good. To suppose that it is useful by its own operation in some specific manner unknown to us, is an entire mistake."—*Sir Joseph Lister, British Medical Journal, p. 225-233, July-December, 1871.*

Chondromyxosarcoma of the mandible

■ *John K. Paul, D.D.S., Detroit*

Chondromyxosarcoma is a bone tumor rarely found in the region of the head and neck. The comparative infrequency is evident from the paucity of case reports in the literature. Although the tumor is more common in other bones of the body, particularly the long tubular bones of the limbs, the ribs and innominate bones of the pelvis, the general characteristics of the lesion are the same regardless of its location. Chondromyxosarcoma is usually a slow growing neoplasm and the correct early diagnosis resides in its relative amenability in accessible sites. Unfortunately, since the tumor is usually asymptomatic in its early stages, the patient may not seek treatment until the lesion is far advanced. Diagnosis and treatment require the combined efforts of the oral surgeon, roentgenologist, pathologist and occasionally the orthopedic surgeon.

In the past there has been much confusion regarding the classification of this tumor. The tendency was to include the chondrosarcoma, the term more commonly used in the literature, with the general category of osteogenic sarcomas. Geschickter and Copeland[1] still consider their primary and secondary forms of chondromyxosarcoma to be varieties of osteogenic sarcoma in association with myxomatous connective tissue. Phemister,[2] in 1930, was one of the first investigators to stress the need for distinction. The committee of the Registry of Bone Sarcoma of the American College of Surgeons now recognizes chondrosarcoma as a separate entity.[3] Distinguishing characteristics will be pointed out.

Two distinct varieties of the tumor are recognized, the peripheral and the central types. The classification of secondary, as used by Geschickter and Copeland,[1] includes both of these varieties. The primary form has a slightly different origin.

■ *Etiology*

It is not sufficient to consider only the constituents of adult bone; the development of osseous tissue must be taken into account. The skeletal system is formed from highly differentiated mesoblastic tissue which includes bone, cartilage and connective tissue. These tissues replace an earlier primitive and temporary mesenchymal tissue during the formation of the more durable bony and cartilaginous structures of the adult skeleton. Transition forms between the different connective tissues may persist in certain locations at all ages, and may serve as a starting point for tumors. The per-

This thesis received first prize in the interns' division at Mt. Carmel Mercy Hospital, Detroit, 1951.

From Mt. Carmel Mercy Hospital, department of oral surgery, Detroit.

1. Geschickter, C. F., and Copeland, M. M.: *Tumors of Bone (Including the Jaws and Joints)*. New York: American Cancer Society, 1936, p. 93-152.

2. Phemister, D. B.: Chondrosarcoma of Bone. *Surg., Gynec. & Obst.* **50**:216 (Jan.) 1930.

3. Ewing, J.: A Review of the Classification of Bone Tumors. *Surg., Gynec. & Obst.* **68**:971 (May) 1939.

sistence of connective tissue of the embryonic precartilaginous type in benign tumors provides the origin of chondrosarcoma, which is superimposed on the original benign growth.[3] It is this embryonic origin that must be kept in mind if the etiology of these tumors is to be clearly appreciated.

The incomplete absorption of Meckel's cartilage may account for the cartilaginous rests in the mandible.[4] The occurrence of vestigial rests of cartilage within the substance of the maxilla and premaxilla is a theoretical possibility even though both are regarded as being primarily membranous bones.[5]

The majority of chondrosarcomas have a cartilaginous origin, arising from pre-existing chondromatous tumors, whereas osteogenic sarcomas originate from primitive bone-forming mesenchyme. Instead of undergoing transformation, the cartilaginous structure of the preceding benign growth acts as a matrix which is gradually destroyed by the malignant growth. Those malignant tumors arising from enchondromas or within the bone are referred to as central chondrosarcomas, while those arising from exostoses or osteochondromas on the surface of bone are classified as peripheral chondrosarcomas. Sometimes it is impossible to prove the pre-existence of the chondroma, but usually the connection is apparent, through history, examination and roentgenographic evidence of the primary tumor.[6]

The possibility that the tumor may be a metastatic lesion must be considered. However, primary bone sarcomas rarely metastasize to the jaws. Probably fibrous dysplasia does not serve as an origin for chondrosarcoma in the jaws, although this transformation has been observed in other bones.[6]

Most investigators agree that there is insufficient evidence to indicate trauma or any other specific factor in the initiation of chondrosarcoma or in the malignant transformation of benign growths (enchondromas and osteochondromas) from which chondrosarcomas so often arise. Geschickter and Copeland,[1] however, do implicate trauma as a factor in the pathogenesis of malignant osseous tumors.

■ *Clinical Features*

Chondrosarcoma may be either central or peripheral, depending on its site of origin. Both forms are primarily a disease of adults, occurring usually between the ages of 30 to 50. Occasionally the patient may still be in his teens. Both sexes are affected equally.

Chondrosarcoma occurs most frequently in the long tubular bones of the limbs, the innominate bones of the pelvis and the ribs, and rarely in the jaw. The primary lesion, as classified by Geschickter and Copeland,[1] is related "to points of muscular attachment and to articular regions where cartilage formation persists throughout life." When occurring in the mandible it may be in the main body of the mandible, the symphysis region, the condyle or the coronoid process.[4] In the mandible, Geschickter and Copeland[1] re-

4. Ward, G. E., and Hendrick, J. W.: *Diagnosis and Treatment of Tumors of the Head and Neck*. Baltimore: The Williams & Wilkins Co., 1950, p. 354-361.

5. Miles, A. E. W.: Chondrosarcoma of the Maxilla. *Brit. D. J.* **88**:257 (May 19) 1950.

6. Coley, B. L.: Neoplasms of Bone. New York: Paul B. Hoeber, Inc., 1949, p. 429-442.

port four cases; Robinson,[7] Gruber[8] and Hickey and Feinman[9] each report one case. Miles[5] and Bernier and Tiecke[10] each report a chondrosarcoma of the maxilla.

A long clinical history is typical, ranging from 2 to 20 years. The tumor may first be noticed accidentally by the patient. It appears as a lump with no other associated symptoms. The tumor gradually enlarges in size until, owing to encroachment on other structures, there is pain or interference of function. As a rule it is not until this time that the patient seeks treatment. The most striking clinical sign is the disfigurement that results as the lesion progresses in size. Pathologic fracture rarely occurs.

A chondromyxosarcoma should be suspected in the presence of a cartilaginous lesion in an adult, particularly if there has been a recent change in character and intensity of symptoms. The lesion is not necessarily benign because of its long duration. The malignant change usually precedes the onset of acute symptoms by a few months.

■ *Roentgenographic Features*

A roentgenogram of a bone presenting an irregularly mottled and calcified shadow in its interior and a fuzzy area of localized destruction of the cortex should suggest the possibility of a chondrosarcoma. In the early central chondrosarcoma this classical picture may not be evident and, therefore, the lesion may be misdiagnosed. As the tumor advances the evidence is more clear cut, especially when the roentgenogram shows the tumor to have expanded peripherally with extensive destruction of the cortex. The outline of the lesion by this time is usually vague. In early lesions there may be persistent evidence of the benign tumor at the base, but outwardly the translucent and indefinite shadow of the chondrosarcoma may be seen.

The peripheral chondrosarcoma destroys the uniform texture and well defined peripheral outline of the benign osteochondroma from which it arises. It presents a blotchy appearance over a considerable area, the radiopacity depending upon the amount of new bone laid down and the amount of bone destroyed by the growth.

■ *Gross Pathology*

The peripheral chondrosarcoma starts its development in the cartilaginous cap of an osteochondroma. In advanced cases the marrow is infiltrated. The central tumor variety replaces the benign enchondroma, and as the lesion advances the cortex is eroded and the periosteum distended. In the far advanced lesions it is difficult to recognize the central from the peripheral type, and distinction is accomplished only if the original benign growth is present. Gross disfigurement is in evidence by this time.

The macroscopic appearance of both varieties is similar. When sectioned the tumor has a shiny, pearly gray cut surface. It varies in consistence, depending upon the amount of cartilage and the

7. Robinson, H. B. G., Metastasis of Chondromyxosarcoma to the Jaw and Tooth. *Am. J. Orthodont. (Oral Surg. Sect.)* **33**:558 (July) 1947.

8. Gruber, M. D. Chondrosarcoma of the Mandible. *J. Oral Surg.* **7**:165 (April) 1949.

9. Hickey, M. J., and Feinman, Jacob, Chondrosarcoma of the Mandible. *New York D. J.* **15**:577 (Dec.) 1949.

10. Bernier, J. L., and Tiecke, R. W., Three Rare Oral Tumors. *J. Oral Surg.* **9**:161 (April) 1951.

presence or absence of degenerative changes. Some tumors reveal considerable hydropic or cystic degeneration; in other neoplasms, calcification and hemorrhagic extravasation may be present.

While some lesions remain well circumscribed, one of the striking features of many tumors is the tendency for extension into the veins. The association of lymphatic metastasis in advanced cases has not been established. Secondary nodules close to the primary site should not be mistaken for lymph nodes.

■ *Microscopic Pathology*

Careful scrutiny and search of adequate material is required in order not to "underdiagnose" the tumor. Heavily calcified or ossified areas tend to disguise the condition. Lichtenstein and Jaffe[11] state that "the histologic picture does not have to be crudely and obviously sarcomatous to indicate chondrosarcoma." Even in the early stage of the evolution the indications of malignancy are present. They reveal that it is the cellular component of the tumor that is important, and attention should be concentrated upon the cytology rather than the intercellular matrix. A tumor is regarded as malignant if, even in scattered fields, "many cells with plump nuclei are to be seen; more than an occasional cell having two such nuclei; and especially if there are giant cartilage cells with large single or multiple nuclei or with clumps of chromatin."[11] Both osteochondromas and enchondromas contain small cells with only one nucleus, the nuclei are small and not plump and no large or giant cartilage cells are present. Obvious accelerated growth activity at the margins of the individual lobules or nodules is indicative of malignant behavior.

The cells of the embryo-like connective tissue are either stellate or elongated spindle forms. These elements produce a syncytium with an increasing amount of clear, hyalin-like ground substance in which the connective tissue cells, after assuming a rounded form, become embedded. It is the presence of this tissue that obviates the myxoma in the diagnosis. The rounded elements scattered throughout the neoplasm are the fetal cartilage cells. These cells produce a ground substance that tends to resemble adult hyalin cartilage, differing in that the cells of the lesion are irregularly arranged and contain nuclei that are larger, more hyperchromatic and frequently undergoing mitosis. The myxomatous tissue is not the result of cartilaginous degeneration, but instead is the predecessor of the later chondral forms which are derived from it. The whole picture is a "transition from fibrous tissue to cartilage with an intermediate syncytial or myxomatous stage."[1] However, some investigators[11,12] feel that the myxomatous tissue is the result of degeneration and its presence is not significant.

Much variation exists in the vascularity of these tumors. Calcification, if present, occurs sporadically and irregularly and is not consistent. Boyd[13] says this is indicative of tumors that have ceased to grow. New bone formation is not prominent and is usually found near the overlying periosteum.

11. Lichtenstein, Louis, and Jaffe, H. L., Chondrosarcoma of Bone. *Am. J. Path.* **19**:553 (July) 1943.
12. Thoma, K. H., *Oral Pathology*, ed. 2. St. Louis: C. V. Mosby Company, 1944, p. 995.
13. Boyd, William, *Surgical Pathology*, ed. 6. Philadelphia: W. B. Saunders Co., 1947, p. 691-695.

■ *Treatment*

Radical resection is the only treatment for chondrosarcoma that offers any prospect of cure. The wider the margin of supposedly normal tissue the better will be the prognosis. Secondary wider removal may be too late to save the patient's life. Conservative treatment is usually followed by slow recurrence and, therefore, great care should be taken to insure complete removal of the tumor-bearing bone during the initial operation.

The lesion is radioresistant; hence roentgen therapy is valueless, except as a palliative measure if the lesion is inaccessible. It may tend to alleviate pain or may be used if complete removal cannot be accomplished. If intensive radiation is instituted first and then followed by surgical intervention, the picture will be greatly complicated. The bone will undergo radionecrosis accompanied by soft tissue destruction in the region, with ensuing secondary infection.[4]

■ *Prognosis*

Chondrosarcoma (peripheral or central) is likely to remain only locally invasive for years, even if left entirely alone. Recurrence is expected following conservative treatment, and after several recurrences the lesion usually has spread beyond the field of operability and metastases have occurred. The prognosis depends on the extent of the lesion.

Metastasis usually occurs late in the disease, which is in contrast to the osteogenic sarcoma which spreads early. It occurs by invasion of the veins followed by circulatory spread. Secondary lesions almost invariably appear in the lung first and the heart secondarily; other organs are rarely affected. Severe respiratory and cardiac difficulties before death may be the indication of intravascular growth.

Lichtenstein and Jaffe[11] feel that the prognosis is better than for osteogenic sarcoma since the chondrosarcoma usually has not metastasized at the time of initial surgical intervention. Geschickter and Copeland[3] report 27 per cent cures following radical resection of the tumor in the long bones of the body. Coley[6] reports the five year survival rate on a group of 22 cases of chondrosarcoma in the head and neck region to be 33 per cent.

Ward and Hendrick[4] feel that the ultimate result is not good with chondrosarcoma of the jaw. They report a six month to two year survival rate on their two cases of chondrosarcoma of the jaw. Hickey and Feinman[9] feel that the prognosis is fair if, following resection, there is no metastasis or recurrence within one year. The results are not influenced by age of the patient or location of the lesion. The prognosis is definitely better if the case is an early lesion and the operation aggressive.

■ *Report of Case*

The patient, a 67 year old white male, was admitted to Mt. Carmel Mercy Hospital on November 24, 1950, for diagnosis and treatment of a hard bony enlargement at the left angle of the mandible. Except for the deformity caused by the growth, the patient complained of no symptoms. A small lump was first noted at the left angle of the mandible approximately 10 to 15 years previously. The mass increased in size slowly and remained entirely asymptomatic, which accounted for the patient's delay in seeking

treatment. He recalled no trauma to the region. He had been under treatment for diabetes mellitus and a cardiac condition for two years. Further history was noncontributory.

EXAMINATION—The patient was a well developed, well nourished, white man in no acute or chronic distress. There was a definite asymmetry of the mandible as a result of a nodular swelling at the angle of the left mandible. This swelling measured 4 cm. in diameter. To palpation it was well circumscribed and firm and appeared to be fused on part of the osseous structure of the region. It was asymptomatic with regards to pain or limitation of motion of the jaw. Cervical lymph adenopathy was absent.

Intraoral examination revealed the mouth to be edentulous. The patient's dentures caused him no discomfort and when removed there was no associated irritation to the mucous membrane. The swelling was only slightly palpable from an intraoral approach.

Further physical examination revealed a systolic blood pressure that varied from 140 to 210 and a diastolic pressure that varied from 90 to 120. The heart was enlarged to the left. An electrocardiogram revealed extensive damage to the heart. Laboratory studies disclosed a normal peripheral blood. The urine showed a 4 plus sugar, without the presence of acetone. The fasting blood sugar revealed 449 mg. per cent. On this basis the following clinical diagnosis was submitted by his physician: (1) diabetes mellitis; (2) essential vascular hypertension; (3) hypertensive heart disease, Grade I; (4) hypertensive encephalopathy.

Lateral jaw and anteroposterior roentgenograms revealed a radiolucent area at the angle of the left mandible (Fig. 1, *A* and *B*). The roentgenograms showed a mottled destruction of the bone with expansion of the cortex. The cortex appeared to be intact but showed considerable thinning. The line of demarcation from normal bone was poorly defined.

The tentative diagnosis was osteochondroma of the mandible.

TREATMENT AND COURSE—The purpose of this operation was to secure a specimen for biopsy and at the same time to remove as much of the tumor as possible. This procedure would not require submitting the patient to a second operation if the lesion proved to be benign, since the possibility definitely existed.

On December 2, 1950, after control of the diabetic condition, the operation was performed. Under local anesthesia, a 5.5 cm. incision was made, beginning 1 cm. above and behind the angle of the left mandible and extending forward and downward in a curve so as to stay 1 cm. below the inferior border of the mandible. To expose the angle of the mandible the deeper tissues were bluntly dissected. The inferior attachment of the masseter muscle, being directly over the tumor mass, was freed by means of sharp dissection. The bone overlying the mass was thin and easily removed, revealing the contents of the tumor to be composed of soft tissue, grayish in color, slightly granular and extremely vascular. Extensive curettage of the tissue resulted in the loss of a large region of the angle of the left mandible. The lesion was found to have direct contact with the inferior den-

tal canal and protruded into this canal in an anterior direction. Curettage of this portion of the tumor was attempted, care being taken to preserve the normal contents of the canal (mandibular nerve, vein and artery).

Absorbable gelatin sponge saturated with thrombin solution was placed in the cavity so as to nearly fill it. A penrose drain was placed in the region and the tissues closed. A pressure bandage was applied.

The postoperative recovery was rapid. The patient returned for observation and there has been no external sign of recurrence of the tumor. When last seen, May 5, 1951, the patient complained of a slight numbness of the lower lip on

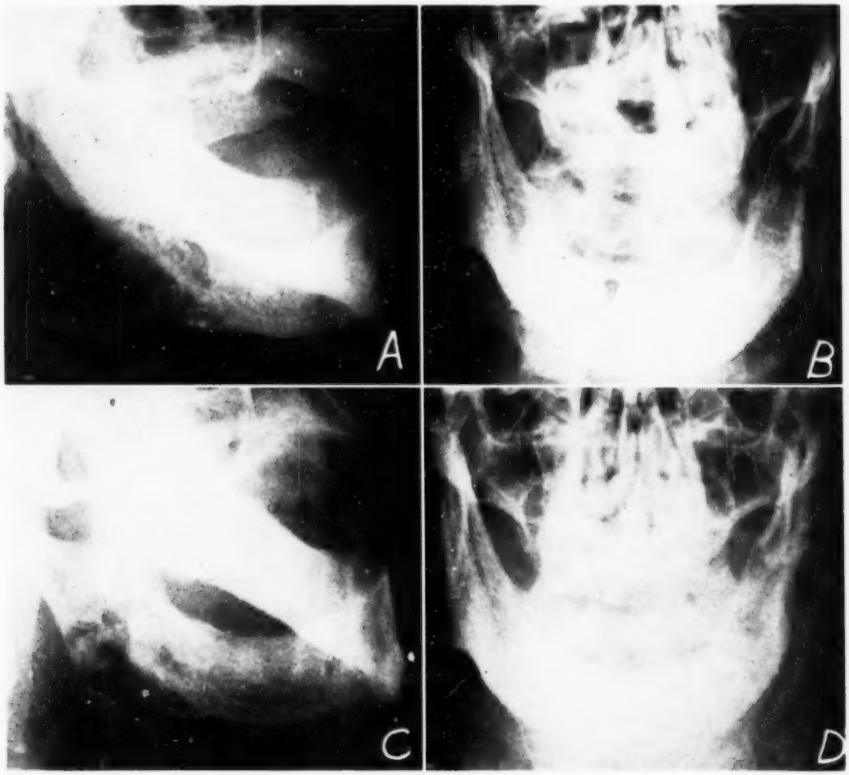


Fig. 1.—A and B: Preoperative lateral and anteroposterior views showing radiolucent area at angle of left mandible. C and D: Lateral and anteroposterior views taken five months after operation. It was felt that all of the tumor had not been removed

the left side. Roentgenograms were taken (Fig. 1, *C* and *D*), and it was felt that all of the tumor had not been removed. The patient has been asked to return for observation. A wider resection of the region, resulting in removal of half of the mandible, would be the treatment of choice, but because of the patient's poor physical status and prognosis it is questionable whether or not this procedure is justified.

PATHOLOGY—The gross examination of the specimen revealed multiple pieces of soft, friable, grayish-pink tissue, varying from 1 to 3 cm. in diameter. Throughout the fragments of tissue were multiple hard, gritty masses which had the gross characteristics of bone. In addition, there was a copious quantity of friable, soft, yellow to grayish red material.

Microscopically (Fig. 2 and 3), approximately half of the tissue consisted

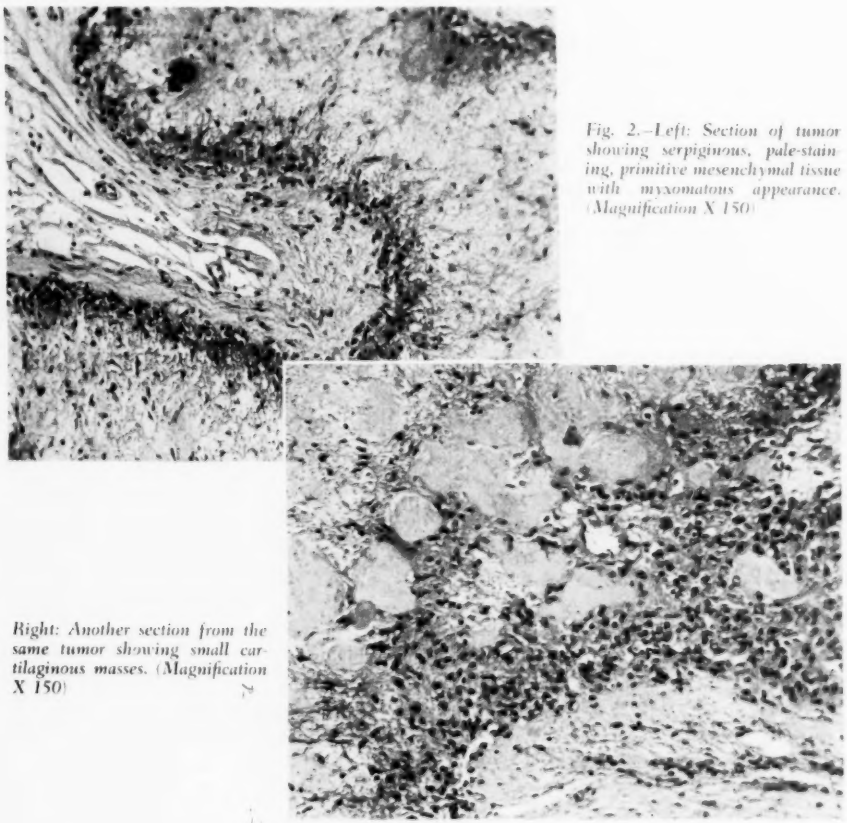


Fig. 2.—Left: Section of tumor showing serpiginous, pale-staining, primitive mesenchymal tissue with myxomatous appearance. (Magnification X 150)

Right: Another section from the same tumor showing small cartilaginous masses. (Magnification X 150)

of a pale-staining matrix in irregular anastomosing cords and columns, apparently replacing the bone marrow. This matrix contained a few spindle or stellate cells with somewhat hyperchromatic nuclei showing moderate variation in size. The cellular components were more numerous at the periphery of these masses and, in these areas, the degree of pleomorphism was greater. The tissue presented a definite myxomatous appearance and resembled primitive mesenchymal tissue with potentialities toward the development of cartilage and bone.

In some portions there were masses of calcium representing calcified bone and probably remnants of the mandibular osseous structure. In other areas there was a definite chondroblastic differentiation. A chondromucinous matrix was present in which cells of irregular size and shape were identified. Lacunae with

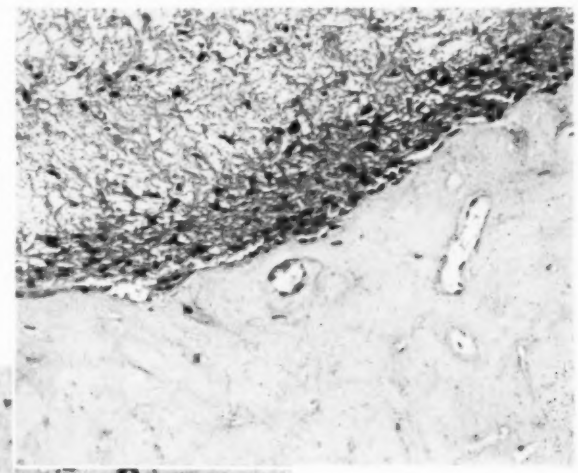
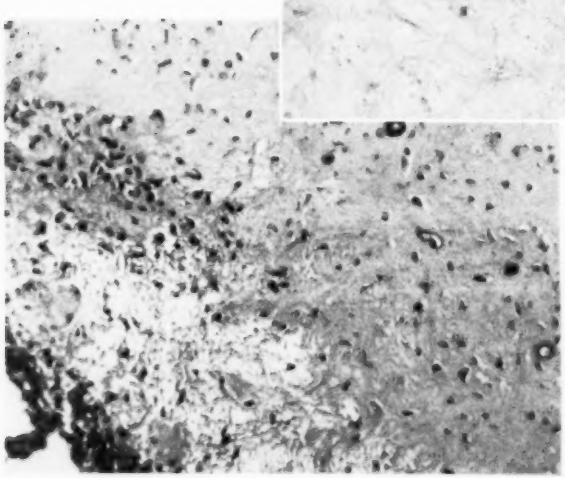


Fig. 3.—Right: This section illustrates a large dense acidophilic trabecula with cartilaginous cells. (Magnification X 150)



Left: This section illustrates a malignant chondroblastic area with minimal calcification. (Magnification X 150)

single and double chondroblasts were seen. These cells presented bizarre shapes and were hyperchromatic. In still other areas, the primitive tissue was changed to a dense pink staining substance with only a few scattered nuclei, vaguely resembling osteoid tissue. Dilated vascular channels were seen; tumor emboli were not observed.

The final diagnosis was chondromyxosarcoma (Grade I) of the mandible.

■ *Summary*

Chondromyxosarcoma is fortunately a rare bone tumor of the jaws. Although, in the past, it has been classified with the general category of osteogenic sarcomas, the committee of the Registry of Bone Sarcomas of the American College of Surgeons now recognize it as a separate entity. Etiologically, the persistence of connective tissue of the embryonic precartilaginous type in a benign tumor (chondromas) makes possible the origin of a chondrosarcoma which then becomes superimposed on the original benign growth. Two distinct varieties of the tumor are recognized, the central and peripheral forms. Those arising from enchondromas within the bone are termed central, while those originating in osteochondromas on the surface of bone are referred to as peripheral.

The tumor occurs primarily in adults between the ages of 30 and 50. A long clinical history is typical and the patient usually does not seek treatment until the tumor becomes painful, interferes with function or causes gross disfigurement. Roentgenographically the lesion presents an irregularly mottled radiolucent area of bone destruction. From the histopathologic examination a conclusive diagnosis is easily established if attention is concentrated on the cells rather than the intercellular matrix.

Treatment is radical resection of the lesion. The wider the margin of supposedly normal tissue the better will be the prognosis. Although the tumor usually remains locally invasive for years it eventually will metastasize through the veins to the lungs.

A case report of a chondromyxosarcoma of the mandible is presented. It probably represents the central variety of the tumor since the cortex was mainly intact. The tumor is slow growing and has had no obvious recurrence in 5 months.

■ A Member's Trust

Every member and every official of an organized group is in the position of a trustee, and the trust he guards is the organization's ideal. Since (except in the case of open and flagrant transgression) no penalty can be attached to abuse of this fiduciary obligation, it becomes a matter of simple honor and decency not to abuse it.—"*Organized Effort*," *The Journal of the International College of Surgeons* 15:237, *February, 1951*.

Median cleft lip: *report of case*

■ *W. Schneider, D.D.S., and E. H. Reiter, D.D.S., M.S., Cleveland*

An examination of the medical literature reveals median cleft lips have been reported infrequently. Cleft lips occur more frequently on the left side than on the right, and a deformity occurs more often on either side or both but rarely in the midline.[1] Of the 1,000 cases of cleft lip or cleft lip and palate reported by Andersen[2] only two were midline clefts. They did not discuss the nature of these clefts. Thoma[3] states that median clefts of the upper lip are rare. There may be a defect involving the lower border only or a complete fissure separating the premaxilla in the median line, even extending into the nasal septum. In other cases the philtrum or the entire premaxilla may be missing.

A bifid nose accompanying a median cleft lip was recently reported by Weaver and Bellinger.[4] They found that only one case of bifid nose associated with midline clefts of the upper lip had been reported before the presentation of their case. Arey[5] states a median defect of the upper lip or jaw through incomplete union of the median nasal processes is a rare anomaly.

Cleft lips have been found to be associated with other deformities of the body; cleft palate and cleft hand and foot may accompany cleft lips.[6] Missing or peg-shaped incisors are a common occurrence with cleft lips.[7] Sireniform malformations of the posterior limbs are frequently associated with anterior abnormalities such as cleft lip.[8] Cleft lip has been recognized with other malformations but statistical data are insufficient to correlate one with the other.

According to Arey[9] the median groove of the upper lip is the zone between the median nasal processes after they have fused with the maxillary processes. The lateral margin of the median nasal processes are indicated by angular indentations of the upper lip. Wilkinson[10] states that from the mesial nasal processes are developed the nasal septum, the columella, the midportion of the upper lip and the premaxilla. These processes may fail to unite in the second month. True median cleft lip is the best known deformity which may result. Veau,[11] in a de-

Resident in oral surgery, Mount Sinai Hospital, Cleveland.
Chief of oral and maxillofacial surgery, Mount Sinai Hospital, Cleveland.

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Median cleft of the upper lip with absence of the philtrum, columella, vomer and premaxilla

tailed investigation of the development of cleft lip in human embryos, claims that it is caused, not by failure of the facial lobes to grow together, but by failure of the epethelial layers to break down and allow the lobes to fuse after contact. Probably both processes are at work in normal development, the failure of contact being certainly greater in some cases of cleft lip or cleft palate than in others.

REPORT OF CASE—A negro girl was born at full term by normal spontaneous delivery at the Mount Sinai Hospital on August 13, 1948. The mother, an albino, aged 22, and the father, aged 40, have one normal living child.

The infant was born a microcephalic and had convulsions at time of delivery and at intervals for several days. The eyes exhibited a rotary nystagmus. The baby had a median cleft of the upper lip with absence of the philtrum, columella, vomer and premaxilla (see illustration). There was a slight notch in the maxilla due to the absence of the premaxilla. The remaining physical findings were essentially negative.

The post partum course of the baby was not followed, because of its removal from the hospital at the end of five days, by request of the parents.

SUMMARY—A review of the literature, indicating the rarity of the median cleft lip, is given. Associated deformities are described. A case of median cleft lip is presented.

■ A Satisfactory Explanation of Anesthesia Needed

C. D. Leake, in discussing the theories of anesthesia, found that after one hundred years of practical success in the control of pain in surgical procedures, we still do not know what anesthesia is. He stated prophetically that "it may be possible indeed not only to afford pain relief through anesthesia, but even to develop such principles as effectively may prevent pain. While these principles may be chiefly concerned with human relationships, they need not be beyond the scope of medical endeavor, since the prime purpose of medical men is to alleviate and to prevent pain." This statement was published in 1942 with the expressed hope that at the bicentennial celebration of surgical anesthesia a hundred years hence, a more satisfactory explanation of surgical anesthesia in relation to the emotional life of the patient would be found.—*Bernard B. Raginsky, "Some Psychosomatic Aspects of General Anesthesia," Anesthesiology 11:397, July, 1950.*

A schwannoma of the inferior alveolar nerve: *report of case*

■ *Frederic O. Baetz, D.D.S., St. Louis, Mo., and John Shackelford, D.D.S., Detroit*

The occurrence of a schwannoma in the oral cavity is relatively uncommon. A schwannoma, also called neurilemmoma, neurinoma, perineurial fibroblastoma and peripheral glioma, originates from the neuroectodermal part of the nerve, the cells of Schwann or from its mesodermal covering. These tumors are benign and encapsulated, and they rarely recur after removal even if the capsule is left behind. A malignant tumor probably never develops from them. Schwannomas are soft and smooth. They possess a capsule but no nerve fibers and are usually solitary.

A schwannoma or neurilemmoma is not a true nerve tumor. It is of nerve sheath derivation. These tumors are sometimes hereditary and are extremely varied in their manifestations. They can be found in conjunction with von Recklinghausen's disease.

Schwannomas occur in the posterior roots of the spinal cord, especially in the cauda equina, in the cranial nerves such as the eighth and fifth, in the nerves of the respiratory and gastrointestinal tract and in the peripheral nerves. They may arise in both sexes at any age, and probably in all races.

Histologically, the picture is characteristic. A schwannoma consists of stroma and nuclei. The stroma is made up of very fine fibrils which often form whorls, bands and bundles of concentric sheaths. The nuclei are slightly elongated, rodlike, or elliptic, and are arranged along the course of the fibrils. Some areas are rich, others poor, in nuclei. A combination of such areas gives a palisade, or zigzag, arrangement. The bulk of these tumors contain no neurites. However, expansile growth of the tumor inside the epineurial sheath of a large nerve may injure its nerve fibers, so that sprouts from them enter the periphery of a tumor and may be detected there by appropriate technical methods.

These tumors are surrounded by the perineurium except at the point of attachment to the nerve. When the nerve of origin is small, it will be found, if at all, in the capsule of the tumor. If the nerve is large, the tumor generally forms inside the epineurial sheath. The peripheral tumors usually form a tender lump and may be palpated in the subcutaneous region, provoking pain along the path of the affected nerve upon pressure. When the tumors are small they are relatively solid, but as they grow larger, degeneration may occur and the tumor may become partly cystic.

Assistant professor of oral surgery, Washington University Dental School, St. Louis, Mo.
Attending oral surgeon, Holy Cross Hospital, Detroit.

Fig. 1.—A preoperative roentgenogram revealed two large radiolucent regions in the ascending ramus and in the body of the mandible

REPORT OF CASE.—A white female, aged 43, presented herself for evaluation of a large mass in the region of the angle of the left mandible.

For a year the patient had been aware of a mass at the angle of the left mandible. The tumor was growing larger and recently became tender on slight pressure. The mass was causing

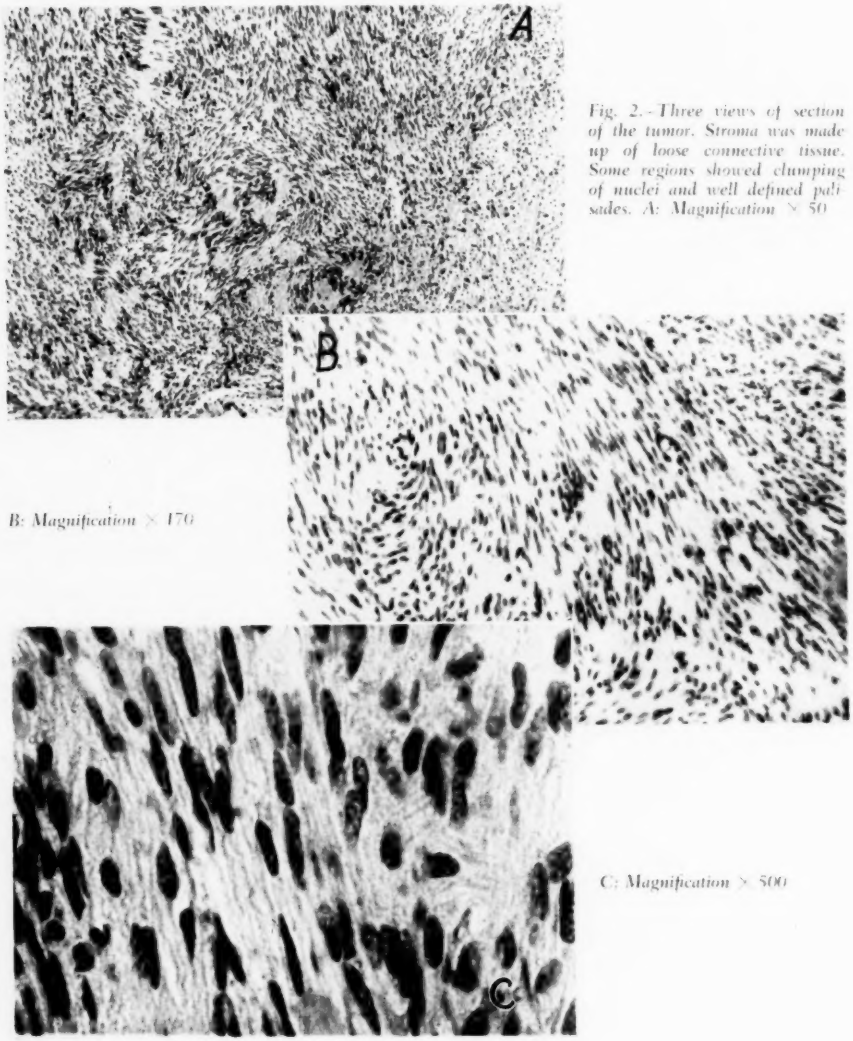

Fig. 2.—Three views of section of the tumor. Stroma was made up of loose connective tissue. Some regions showed clumping of nuclei and well defined palisades. A: Magnification × 50

B: Magnification × 170

C: Magnification × 500

Fig. 3.—Postoperative roentgenograms taken after three months (left) and after twelve months (right) showed healing with no evidence of tumor recurrence.

considerable asymmetry of her face, and she was unable to wear her partial lower denture. The patient was hospitalized for the removal of this tumor.

Her physical examination was essentially negative. There was no history of this type of tumor in her family.

EXAMINATION—On examination the temperature was normal. The patient was in good general health. There was a mass approximately 7 by 3 cm. at the angle of the left mandible extending downward to the left submaxillary region. The tumor was soft and tender on palpation with no evidence of induration or fluctuation. The regional lymph nodes were not palpable. The oral mucous membrane and tongue were negative. A noninfected root fragment was noted in the left mandible. The oral hygiene was good. The left mandible was edentulous in the molar region. The mucobuccal fold in the left mandibular molar region was elevated by the mass. There was no induration.

A roentgenogram revealed two large radiolucent regions in the body and ascending ramus of the left mandible (Fig. 1). An intraoral biopsy was taken from the mandibular molar region.

Microscopically, sections of the tumor showed it to be partially encapsulated. The stroma was made up of loose connective tissue with prominent palisading. Some regions showed clumping of nuclei and well defined palisades (Fig. 2). There was no evidence of malignancy. The growth was diagnosed as schwannoma.

OPERATION—Under endotracheal anesthesia the tumor was removed extraorally. It was attached to the inferior alveolar nerve in the region of the mandibular foramen. The inferior alveolar nerve and vessels had been forced against the lingual plate of the mandible. The buccal plate of bone had been resorbed by pressure of the tumor.

COURSE—The postoperative recovery was uneventful. There was no postoperative facial paralysis. Anesthesia to the left side of the lower lip persisted for about six weeks.

Roentgenograms taken three months later and again after 12 months showed healing with no evidence of tumor recurrence (Fig. 3).

Actinomycosis treated with aureomycin: *report of case*

■ *Ronald Grant, D.D.S., M.S., Dearborn, Mich.*

The effectiveness of aureomycin in the treatment of diseases caused by certain gram-positive and gram-negative organisms, certain virus infections and rickettsial diseases is now a matter of clinical experimental record. Reports of its effectiveness in the clinical treatment of mycotic infections have not yet been recorded. The drug was first described by Duggar and his associates[1] as a yellow crystalline antibiotic obtained from a new species of the established genus *Streptomyces aureofaciens*.

Its relatively low toxicity and minimal side effects have added to its desirability.

Actinomycosis is the most common of the symptomatic mycotic diseases and may be caused by either *Actinomyces bovus* or several species of the genus nocardia. When the disease appears in the facial region, it assumes a low grade chronicity, and forms single or multiple granulomas in the skin which have a tendency to abscess and drain through multiple minute sinuses. The disease is not limited to the facial region or external surfaces. It may occur as a primary infection in the lung or gastrointestinal tract. It is a malignant disease and will metastasize even when controlled. When it occurs in the region of the face and neck, the portal of inoculation is usually the site of a recent tooth extraction, compound fracture, or cuts and abrasions of the skin.

REPORT OF CASE—A 39 year old white man was admitted to the Veterans Administration Hospital, on August 31, 1949. He complained of pain and swelling of the left side of the face which had been present for two months. The patient had sustained a fracture of the left body of the mandible when kicked in the face, on June 2, 1949. He denied any evidence of laceration of the face. He did expectorate blood from his mouth immediately and for several days after. He was seen by his dentist who advised him that hospitalization was necessary but the patient was financially unable. He did not receive any further treatment or medical advice. He continued to have swelling and discomfort with limitation of movement of his jaw. Two weeks previous to admission to this hospital he had increased pain and swelling which extended into his neck. He experienced difficulty in swallowing liquids and was unable to take any form of solid nourishment.

EXAMINATION—The patient was a well developed, well nourished white man who stated that he had lost approximately 18 pounds during the last two months. There was an indurated area approximately 12 by 10 cm. extending from the angle of the left mandible to the commissure of the left lip and downward to the cervical region. The swelling was brawny without evidence of fluctuation and there was a single abscess approximately 1.5 by 1.5 cm. from which there was moderate serous drainage (Fig. 1, above).

Oral examination was limited because of severe trismus. There was evident edema of the left buccal mucosa which was tender to palpation and a seropurulent discharge when pressure was applied externally.

Reviewed in the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions are the author's and do not necessarily reflect the opinion or policy of the Veterans Administration.

Oral surgeon, Veterans Administration Hospital, Dearborn, Mich.

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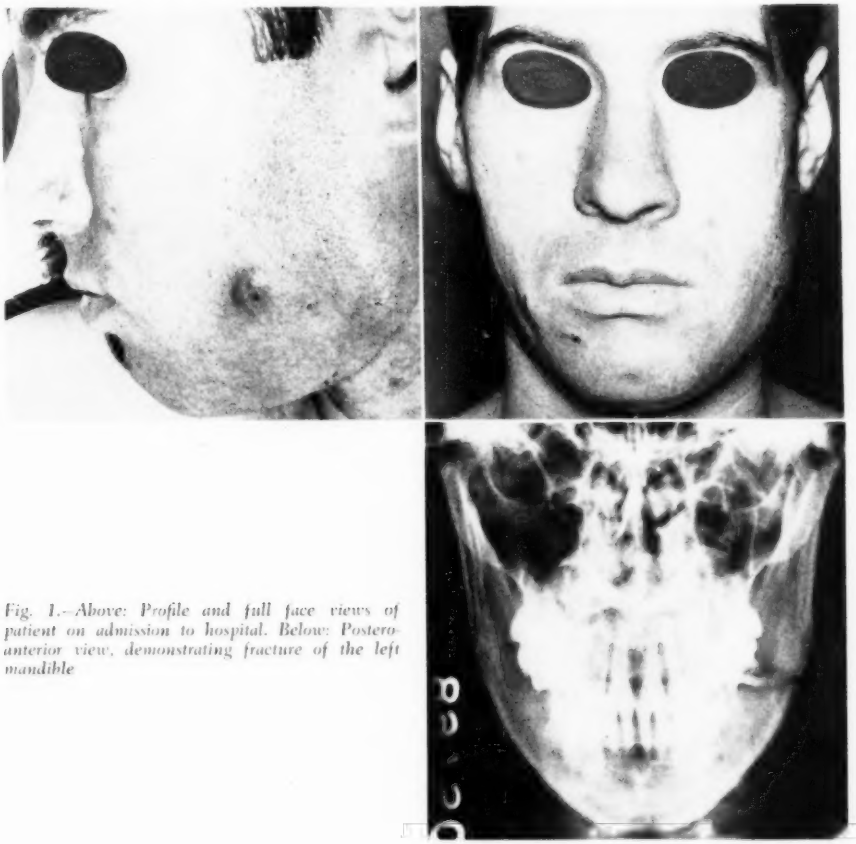

Fig. 1.—Above: Profile and full face views of patient on admission to hospital. Below: Postero-anterior view, demonstrating fracture of the left mandible

Roentgenographic examination of the chest was negative. Roentgenograms of the mandible demonstrated an oblique fracture through the posterior portion of the left body of the mandible. The fracture extended upwards through the alveolar ridge, and the second molar was in the line of fracture. The major fragments were in good position (Fig. 1, below).

The single raised abscess on the left side of the face was aspirated and a serous exudate recovered. Macroscopic examination revealed sulfur granules. Bacteriologic examination revealed *Actinomyces bovus*.

The diagnosis was untreated traumatic compound fracture of the left body of the mandible and actinomycosis.

TREATMENT—Immediately after the patient was admitted, a regime of penicillin, 300,000 units daily, and sulfadiazine, 1 grain every four hours, with equal doses of sodium bicarbonate was started. Hot moist dressings were applied to the left side of the face and the patient was given a high protein liquid diet. On September 6 when the diagnosis of actinomycosis was reported, the penicillin and

sulfadiazine were discontinued and aureomycin therapy (2 Gm. daily) was initiated.

No attempt was made to reduce the fracture or to remove the second molar, as there was relatively little displacement of the major fragments. Likewise it was considered inadvisable to manipulate or distort any of the tissues in this region because of the possibility of inoculation of the blood vessels and subsequent transient bacteremia which undoubtedly would spread the disease to other parts of the body.

Prompt improvement was noted within five days after the start of aureomycin therapy. On the tenth day the edema had subsided and the abscess on the face was completely healed. There was no evidence of drainage and the patient was able to acquire more adequate movement of the mandible. He was given solid foods.

The patient remained asymptomatic for the next eight days. At that time a small abscess was observed approximately 2 cm. posterior to the site of the previous one. The contents of this was cultured and no evidence of actinomy-

Fig. 2.—Above, left: Recurrent swelling and formation of a draining abscess in an approximating region. Above, right: On April 19, there was no evidence of recurrent infection. Below: Fractured mandible was well healed

cosis was present. It remained asymptomatic for five days more and healed spontaneously.

The aureomycin was continued as a sustaining therapeutic procedure as it was not considered the patient had received maximum hospital benefit. Shortly thereafter the patient's attitude towards hospital personnel and nursing staff became somewhat belligerent. It was impossible to reason with him and he continued to demand discharge. On the evening of Ocober 2 he demanded his clothes and a discharge. He was advised of the potentialities of recurrence of the infection. He refused to accept, and was discharged against medical advice.

Three weeks later the patient returned to the hospital for emergency treatment because of recurrent swelling and formation of a draining abscess in an approximating region (Fig. 2, above, left). On this occasion he pledged his utmost cooperation.

The patient was readmitted to the hospital and again aureomycin was prescribed. On this admission the dosage was increased to 3 Gm. a day. On this occasion his response to aureomycin therapy was rapid. On the sixth day the abscess had completely ceased draining. The patient remained asymptomatic and his condition was considered sufficiently controlled to consider removing the left mandibular second molar which was in the line of fracture. This procedure was carried out without complication and convalescence was uneventful. Aureomycin therapy was reduced to 1.5 Gm. daily as a sustaining dose and on December 2, 1949, the patient was discharged having received maximum hospital benefit.

He returned to the clinic at biweekly intervals and he continued to remain asymptomatic clinically until January 7, 1950. On this date a small abscess and sinus were observed in relatively the same region as previously described on his last admission. There was no evidence of drainage. He was readmitted to the hospital. Bacteriologic examinations revealed no evidence of actinomycosis.

On January 14, 1950, the sinus tract which had subsequently formed was excised. The mandible was exposed externally for inspection, and evidence of healing with callus formation in site of fracture was observed. The excised tissue of the sinus, on histopathologic examination, showed moderate epithelial hyperplasia with diffuse lymphocytic infiltration into subepidermal tissue with underlying scar showing simple necrosis. No organisms were recognized.

No therapy was considered necessary. However, as a prophylactic measure the patient was given aureomycin for the first three days. He remained entirely asymptomatic and was discharged on the tenth day.

The patient was seen in the clinic at subsequent biweekly intervals until April 19. During this period there was no evidence of recurrent infection, and he was considered completely cured (Fig. 2, above, right), and the fracture well healed (Fig. 2, below).

COMMENTS—1. The rapid improvement that the patient displayed when initially given aureomycin should be a criterion for its use in the treatment of actinomycosis. Had this patient not disturbed the therapy, undoubtedly he would have been completely recovered in another 15 to 20 days.

2. Since originally recording this case one other case of actinomycosis treated with aureomycin has been reported.[2]

Good judgment dictates the boundaries

THE EXACT SCOPE of the field of oral surgery has never been clearly defined. The probability is that a sharp definition can never be made. The specialty of oral surgery, however, has generally been considered to be that branch of surgery which deals with the diagnosis and treatment of diseases, malformations and injuries involving the oral cavity, the teeth, the jaw bones and the immediately dependent structures. This seems to be a reasonable definition, and these essentials are included in most state laws governing the practice of dental surgery.

Oral surgery has made great strides in the last fifty years and has reached its present enviable status because of the difficult and prolonged labors of a group of men with vision enough to realize the need for high standards in didactic and practical teaching programs. It is true that, by advanced training in the fields of anatomy, physiology, pathology and chemistry of the oral cavity and also by advanced training and experience in the hospital management of injuries, abnormalities and diseases of the mouth, the oral surgeon is eminently qualified to take care of these conditions. He is the physician of the oral cavity. His superiority is generally recognized by medical specialists who treat diseases in the contiguous fields. He may be endangering this well earned reputation by attempting to take over the entire field of head and neck surgery.

A few dentists, because of advanced study in anatomy and some clinical experience with general surgeons, technically might skillfully do a neck resection. Not only is the dental oral surgeon poorly prepared to manage the complicating factors that might be present incident to such an operation, but also he cannot adequately manage the preoperative and postoperative care required in this type of extensive surgical procedure. It is unnecessary for a dentist to do this type of operation. There are many well trained men in the allied surgical specialties who are eminently better qualified to treat this type of case than is the dental oral surgeon.

In some cases a dentally trained oral surgeon is perfectly justified in opening a maxillary sinus for the removal of a tooth, or for the removal of a root lost in the maxillary sinus. In those cases where long-standing chronic maxillary sinus disease does not exist, a dentally trained oral surgeon might well close a chronic oral maxillary fistula. However, all sinus diseases of dental origin do not fall within the province of the oral surgeon. A rather high percentage of maxillary sinus disease is due to infections about the apexes of the teeth. It is also true that many lung abscesses develop as a result of aspiration of oral secretions and sometimes from the aspiration of a tooth or a portion of a tooth. This does not justify the oral surgeon treating a lung abscess simply because it is of dental origin.

Some dental oral surgeons are particularly skilled in the treatment of malignant lesions of the oral cavity. The fact, however, that the lesion appears in the oral cavity does not necessarily mean that it is best treated by an oral surgeon. Many of these lesions spread through the blood stream and the lymphatic system to distant regions, and should be treated by medical specialists in the field of tumor pathology.

Some oral surgeons are very much disturbed because congenital cleft lip and cleft palate cases are treated by medical specialists in other fields. It is certainly true that the deformity involves the tissues of the mouth and jaws. It is also true that these deformities involve, to an extensive degree, the structures of the external nose, the internal nose and the nasopharynx. The technical aspect of the operation is a small part of the management of this important problem. A comprehensive understanding of many facets not ordinarily well mastered by the dental oral surgeon is imperative in the treatment of these cases. It is true that much of the outstanding work in the development of cleft lip and cleft palate surgery has been done by dentists. But the fact that the teeth and tissues of the jaw bones and palate are involved does not place this entire problem in the realm of oral surgery. Cleft lip and cleft palate are best treated in centers where the cooperative efforts of the oral and plastic surgeon, the otolaryngologist, the prosthetist, the general dentist, the orthodontist, the speech therapist, the psychiatrist and the social worker are employed.

In most instances allergic and inflammatory diseases, malformations and tumors of the nasopharyngeal region are best handled by the otolaryngologist. The oral surgeon would give the patient the best possible chance for recovery and a good result if he would seek medical consultation on nasal, orbital and basilar skull fractures.

Oral surgeons who stray outside the field attempt to justify these meanderings on the basis that they are qualified to do so by the American Board of Oral Surgery. The American Board of Oral Surgery expects its candidates to be conversant with the problems in the field of cleft lip and cleft palate surgery. It also expects its candidates to

have a comprehensive understanding of the histopathology of tumors of the mouth and to understand the pathways through which malignant tumors may spread. The Board also at times holds its candidates responsible for a knowledge of the anatomy of the field immediately adjacent to the oral cavity. However, the American Board of Oral Surgery does not expect the candidates to assume responsibility for all of the diseases, malformations and injuries in the regions adjacent to the oral cavity. Certification by the American Board of Oral Surgery does not imply competence of the licentiate in the general field of head and neck surgery.

In most instances it is not the well trained oral surgeon who is transgressing the bounds of oral surgery. Many pseudo-oral surgeons, having taken short courses or being otherwise exposed inadequately to oral surgical procedures, are the ones who bring criticism upon the specialty. The well trained man knows his limitations and stays within his field. Transgressors bring disrepute upon themselves and harm to the profession of oral surgery by antagonizing the members of the medical profession. The otolaryngologist, the plastic surgeon or the general surgeon cannot have a respectful attitude toward the oral surgeon who continually oversteps the bounds of his field.

The dental oral surgeon should confine his activities to the oral cavity, which includes the teeth, the jaws and their immediately contiguous structures. There are still many unsolved problems in the field of oral surgery that present a challenge. The busy oral surgeon will have so much to do in the immediate region of the oral cavity that he will not find the time or the necessity to stray into the provinces of the allied medical specialists.—*Reed O. Dingman.*

VOLUME 9 • OCTOBER 1951 • NUMBER 4 SURGICAL ORAL PATHOLOGY

A compilation of the material received by the registry of oral pathology

■ *Joseph L. Bernier, D.D.S., M.S., and Richard W. Tiecke, D.D.S., M.S., Washington, D. C.*

The Registry of Oral Pathology, an activity of the Council on Dental Museum and Registry of the American Dental Association, is housed at the Armed Forces Institute of Pathology and receives material from a number of sources.

The purpose of this report is to enumerate these sources and to show the variety of the material.

During the period December 1, 1950, to June 1, 1951, a total of 1,902 cases were received. The nasopharynx, oropharynx and hypopharynx, as well as the oral regions, were represented.

Three hundred and twenty-eight (17.25 per cent) of all cases received were from civilian sources, chiefly private practitioners. The number from this source has risen steadily during the last few years, suggesting that tissue is being removed for diagnosis more frequently than heretofore.

Five hundred and ninety-three cases (31.18 per cent) were received from the Veterans Administration. Many of the malignant tumors are received from this source since the patients are in a higher age bracket when malignant disease is more frequent.

Six hundred and sixty-seven cases (35.07 per cent) were from Army installations. This does not represent all cases on which a biopsy was performed since many cases are screened at the histopathologic centers. Included is material from autopsies on all patients who died as the result of a lesion primary in the oral regions and pharynx.

Two hundred sixty-four cases (13.88 per cent) were received from the Navy. Cases from this source have been increasing steadily during the last few months.

Nine cases (.47 per cent) were received from the Air Force. This low figure is somewhat misleading and can be explained by the fact that many Air Force personnel are cared for in Army installations.

Colonel (D. C.) U.S. Army; chief, Dental and Oral Pathology Section, Armed Forces Institute of Pathology, Washington, D. C.; executive secretary and pathologist, Registry of Oral Pathology of the American Dental Association.

Major (D. C.) U. S. Army, Army Medical Center; resident, Oral Pathology, Armed Forces Institute of Pathology, Washington, D. C.

Table 1

Contributors of material from December, 1950 to June, 1951

Contributor	Cases	
	Number	Per cent
Army	667	35.07
Veterans Administration	593	31.18
Private sources	328	17.25
Navy	264	13.88
Public Health	41	2.15
Air Force	9	.47
Total	1,902	100.00

Forty-one cases (2.15 per cent) were received from the United States Public Health Service. This figure has varied only slightly during the last few years.

From these figures it is seen that the majority of cases are contributed by the Army and the Veterans Administration. Even though many obvious statistical discrepancies exist in material with such preponderantly military aspects, still its extensive concentration in one place is valuable in indicating frequency of occurrence and other data. These data are shown in Table 1.

One thousand, nine hundred and forty-two diagnoses are coded for the 1,902 cases accessioned since some required more than one diagnosis. Of these 1,942 diagnoses, 105 (5.41 per cent) were autopsies and 1,837 (94.59 per cent) surgical specimens (Table 2).

■ *Hypertrophic, Trophic and Inflammatory Lesions*

In this group a significant number defy definitive classification (Table 3). For example the 5 miscellaneous inflammations in the oral cavity could not be considered specific. Also in the 23 cases of glossitis the etiology could not be determined.

It is worth noting that some lesions that are usually considered rare are seen fairly frequently in the Registry material. Mikulicz's disease was seen three times in the six month period covered by this report. Osteomyelitis was noted eleven times and Ludwig's angina, twice.

Keratosis includes those superficial lesions that may appear as white patches clinically with no significant histologic changes. These are not considered premalignant and hence are not classified as leukoplakia.

Table 2

Material diagnosed from December, 1950 to June, 1951

Type	Number*	Per cent
Surgical specimens	1,837	94.59
Autopsies	105	5.41
	1,942	100.00

*Represents incidence of diagnoses rather than number of cases since some cases included both surgical and autopsy specimens.

The diagnosis of leukoplakia is applied to those lesions which may show keratosis as a white patch. However, histologically there is dyskeratosis. The amount of inflammatory exudate may vary considerably and is predominantly chronic. Two types are recognized—a verrucous type, which is characterized by growth above the mucosal surface, and a flat type, which has a more widespread involvement and less keratotic activity.

■ *Oral Lesions of Specific Etiology*

Some lesions in this group are entirely local, while others are the oral manifestations of a systemic disease. Although all are of an inflammatory nature, some exhibit granulomatous changes (Table 4).

Tuberculosis, for example, may occur anywhere within the oral cavity, either as a local lesion, which is rare, or as an infection from a generalized involvement. In the latter instance it usually arises in an ulcer, the *Mycobacterium tuberculosis* being carried by the saliva. These lesions are most frequently found on the tongue, lips and pharynx.

Sarcoid, a form of granulomatous inflammation, was the next most frequently seen in this group. There is no clear-cut agreement as to the etiology of this disease.

Pemphigus and leprosy are relatively rare, only one of the former and two of the latter having been received among nearly 2,000 cases.

Not a single case of syphilis was re-

Table 3
Hypertrophic, trophic and inflammatory lesions

Classification	Number
Hypertrophy	97
Leukoplakia	65
Focal keratosis	40
Periapical abscess (dental granuloma)	40
Sialadenitis	26
Glossitis	23
Acanthosis	22
Ulcers	17
Pharyngitis	15
Tonsillitis	14
Osteomyelitis	11
Sinusitis	11
Laryngitis	10
Lichen planus	10
Gingivitis	9
Pachydermia laryngis	7
Lymphadenitis	5
Mastoiditis	5
Miscellaneous (inflammation)	5
Verruca vulgaris	4
Abscess	3
Mikulicz's disease	3
Stomatitis	3
Fordyce disease	2
Ludwig's angina	2
Residual infection	2
Tracheitis	2
Osteitis	1
Total	454

Table 4
Oral lesions of specific etiology

Classification	Number
Sarcoid	4
Tuberculosis	4
Blastomycosis	2
Herpes simplex	2
Leprosy	2
Actinomycosis	1
Histoplasmosis	1
Leukemia	1
Moniliasis	1
Pemphigus	1
Rhinoscleroma	1
Rhinosporidiosis	1
Total	21

corded during the six month period, which may be due to one of several factors. Probably the most noteworthy is the newer methods of treatment. The decrease may also be due to more effective prophylaxis than heretofore. Not many

Table 5
Benign oral tumors (other than odontogenic)

Classification	Number
Papilloma	128
Fibroma (all types)	91
Mixed tumors	85
Polyps (nasal, aural, and larynx)	65
Laryngeal nodes	45
Hemangioma	26
Granuloma pyogenicum	19
Muco-epidermoid tumors	10
Myoblastoma	6
Nevus	6
Warthin's tumor	6
Giant cell lesion (peripheral)	5
Osteoma	5
Fibrous dysplasia	4
Neurofibroma	4
Ossifyng fibroma	4
Plasmocytoma	4
Angioma	3
Lentigo	3
Lymphangioma	3
Adenoma	2
Eosinophilic granuloma	2
Giant cell lesion (central)	2
Hamartoma	2
Carotid body tumor	1
Chondroma	1
Choristoma	1
Epheles	1
Epulis granulomatosa	1
Glomus jugularis	1
Hematoma	1
Lipoma	1
Lymphoma	1
Myxofibroma	1
Xanthoma	1
Total	541

Table 6
Odontogenic tumors

Classification	Number
Ameloblastoma	4
Cementoma	4
Complex odontoma	2
Odontogenic fibroma	2
Odontogenic myxoma	2
Total	14

cases of secondary or tertiary syphilis are seen today and even fewer reach the pathology laboratory.

■ *Benign Oral Tumors*

A total of 541 benign tumors were received during the period covered by this report (Table 5). The odontogenic tumors are listed separately.

Papillomas were the most common benign tumor. The Registry defines a papilloma as a lesion in which the covering epithelium is projected above the surface in a branching pattern supported by vascularized fibrous connective tissue.

The fibroma was the next most frequent benign tumor. They are well encapsulated tumors exhibiting varying degrees of vascularity. Some of these lesions may show calcification and others, bone formation, particularly when associated with the periodontal membrane. Many of these are referred to elsewhere as epulis.

Eighty-five mixed tumors of the salivary glands and 10 muco-epidermoid mixed tumors were received. This is considered a large number for such a short period of time. At the present no differentiation is made at the Institute as to the various types of mixed tumors other than the muco-epidermoid mixed lesion.

Among the rather rare tumors seen were 2 carotid body tumors, a xanthoma and 4 plasmocytomas.

■ *Odontogenic Tumors*

Only 14 odontogenic tumors were seen during this period (Table 6). In over

Table 7
Cysts of the oral regions (including odontogenic)

Classification	Number
Radicular	118
Retention	42
Follicular (all types)	34
Branchial cleft	24
Type undetermined	15
Dermoid	5
Globulomaxillary	5
Median palatal	3
Ranula	3
Incisive canal	2
Median alveolar	2
Thyroglossal duct	2
Total	255

50 per cent the mesenchymal tissue was the prominent element.

These tumors are now grouped according to the classification unofficially adopted by the American Academy of Oral Pathology in May of 1950.

Ectodermal
- Simple ameloblastoma
- Adenoameloblastoma
- Melanoameloblastoma
- Acanthomatous ameloblastoma

Mesenchymal
- Odontogenic myxoma
- Odontogenic fibroma
  - Dentinoma
  - Cementoma
- Odontogenic fibrosarcoma

Mixed or Composite
- Ameloblastic fibroma (uncalcified)
- Ameloblastic hemangioma (uncalcified)
- Ameloblastic sarcoma (uncalcified)
- Ameloblastic odontoma (partly calcified)
- Odontoma
  - Complex
  - Compound

Odontogenic tumors in which the epithelial tissue is the aggressive element appear to be the most common. In this group the simple ameloblastoma occurred most frequently. There are only 3 adenoameloblastomas in the Institute files and one of those came in during the six month period covered by this report. The In-

Table 8

Malignant tumors

Classification		Number
Squamous cell carcinoma		479
Pharynx	186	
Mouth	118	
Lip	100	
Nodes	22	
Neck	14	
Miscellaneous	13	
Sinus	13	
Salivary glands	6	
Nose	4	
Ear	2	
Bone marrow	1	
Transitional cell carcinoma		23
Adenocarcinoma		21
Sarcoma		18
Lymphosarcoma	7	
Reticulum	5	
Chondrosarcoma	3	
Neurogenic	1	
Osteosarcoma	1	
Type undetermined	1	
Basal cell carcinoma		6
Baso-squamous cell carcinoma		5
Melanoma, malignant		4
Schwannoma, malignant		2
Bronchogenic cell carcinoma, metastatic		1
Lymphoblastoma		1
Mucoid carcinoma		1
Neuroblastoma		1
Renal cell carcinoma, metastatic		1
Thymoma, malignant		1
Total		564

stitute has 5 cases coded as melano-ameloblastomas. However, there is some controversy as to whether they are true odontogenic lesions.

Several acanthomatous ameloblastomas are on file, the epithelial element demonstrating considerable squamous metaplasia.

■ *Cysts of the Oral Regions*

In this group are included not only those cysts associated with the odontogenic apparatus, but certain fissural cysts, retention cysts and others arising on an embryonal inclusion basis (Table 7).

As indicated by the large number in this group, the radicular cyst is the most common lesion.

Follicular cysts are usually associated with unerupted teeth and in a recent survey at the Institute it was shown that approximately 33 per cent of 88 ameloblastomas arose in follicular cysts.

The branchial cleft cyst and retention cyst were also received in greater numbers than expected during this period.

■ *Malignant Tumors*

In this group of nearly 2,000 lesions, 564 (29.04 per cent) were malignant tumors (Table 8). One hundred and eighteen were squamous cell carcinomas located within the oral cavity. This figure is exceedingly large for six months.

At the present time a survey is being conducted on all squamous cell carci-

Table 9
Miscellaneous diseases

Classification	Number
Normal tissue	18
Radiation effect	12
Granulation tissue	10
Cicatrix	7
Senile elastosis	7
Cholesteatoma	6
Fibrosis	4
Arteriosclerosis	3
Inadequate	3
Degenerating bone	2
Necrotic bone	2
Amyloidosis	1
Arrested tooth development	1
Asphyxiation	1
Development defect	1
Ectasia of vessels	1
Edema	1
Foreign body	1
Gunshot wound	1
Hemorrhage	1
Infarction	1
Mesiodens	1
Odontogenesis imperfecta	1
Opalescent dentine	1
Retained root follicle	1
Spongiosis	1
Sclerosis	1
Telangiectasia	1
Thrombus	1
Vesicle	1
Total	93

nomas of the oral cavity, including those in the "red zone of the lip" and the nasopharynx and orthopharynx.

Four malignant melanomas are recorded.

■ *Miscellaneous Diseases*

In Table 9 are listed the miscellaneous diseases which represent only 93 of the total number of cases. Some of the cases, such as asphyxiation and gunshot wound, were autopsies.

■ *Summary*

In this survey the pathologic specimens submitted to the Armed Forces Institute of Pathology during the period December 1, 1950, to June 1, 1951, for inclusion in the Registry of Oral Pathology are tabulated.

■ Repair of Chronic Opening Into Maxillary Sinus

Q.—On two occasions I have attempted to close a chronic opening into the maxillary sinus. At each operation, the flap appeared to be adequate and closure complete. In five or six days both times the wound broke open and the opening persisted. Why does this happen?—*V.E., Grand Rapids, Mich.*

A.—The main reason for the failure of operations of this type is chronic low grade infection of the lining of the maxillary sinus. Before any attempt is made to close a chronic oral maxillary fistula surgically, all evidence of infection in the maxillary sinus should be eradicated. In some instances this may be done by the use of antibiotics and irrigations of the maxillary sinus. In cases, however, where the fistula is of long standing, it may be necessary to do a sinus operation to eradicate the thickened infected polypoid sinus membrane. The operation also may fail because of inadequate blood supply to the flap, insufficient excision of scar about the fistula, failure of approximation of denuded surfaces or from mechanical reasons such as the patient blowing his nose too vigorously or rinsing the mouth too frequently. It is imperative that adequate drainage from the maxillary sinus to the nose be established if not already present before the operation is completed.

■ Correction of Low Buccal Frenum Attachment

Q.—In my practice I have trouble with the low buccal frenum attachment in the upper bicuspid region. Cutting these seems to produce a painful scar and does not eradicate the condition.—*J.K., Los Angeles.*

A.—The buccal frenum seen in some patients in the maxillary bicuspid region may interfere with the proper seating of a denture. This is easily eradicated by means of a Z-plastic procedure. An incision is made on the crest of the frenum when it is placed on a stretch. This is made the length of the frenum, which is generally a matter of 1 to 2 cm. Incisions are extended from each end at angles of 60 degrees for a distance equal to the length of the central incisors. The flaps are undermined and then transposed one for the other and are sutured securely into position. This will deepen the buccal vestibule and eliminate the buccal frenum without the production of painful scar tissue. Consult any good book on plastic surgery regarding the principles of a Z-plastic procedure. This procedure is useful for the elimination of scar contractures anywhere about the mouth.

■ Removal of Granulation Tissue

Q.—Following the extraction of maxillary teeth, should all of the granulation tissue be removed from the tooth socket even if it is close to the maxillary sinus?—*S.H., Edmonton, Alberta, Canada.*

A.—It is the opinion of many operators that it is unnecessary to remove all granulation tissue from the bone following the extraction of an infected tooth. Many operators feel all that is necessary is to break up the tissue with a curet. In our opinion, however, it is dangerous to leave behind tissue of this type as it may remain as an area of residual infection or its epithelial elements may produce a cyst in the region. Even though the region is close to the maxillary sinus, the granulation tissue generally can be curetted out gently without entering the sinus. If the point of a needle is passed through the granulation tissue to the apex of the defect, it can be determined whether or not there is a perforation already existing in the maxillary sinus, or whether the

region is surrounded by firm bone. In either event careful curettement with a sharp curet for removal of this tissue should be done. If the sinus is accidentally opened the patient should bite on a sponge until the tooth socket fills with a blood clot. Generally, this will seal off the sinus and healing will be uncomplicated. The patient should be advised, however, against blowing the nose. Nose drops to keep the natural drainage to the sinus open may be helpful.

■ Continued Anesthesia of the Lip After Alveolar Injection

Q.—Following an inferior alveolar injection for the extraction of a lower tooth, a patient of mine complained of persistent anesthesia of a small area of the lower lip for several weeks. What is the cause of this?—*I.W.W., Lincoln, Neb.*

A.—The most probable cause is injury to some of the fibers of the inferior alveolar nerve by striking the nerve with the point of the needle. It is possible to sever some of the fibers of the nerve with the sharp point of a needle, if the needle strikes the nerve. This anesthesia is temporary and should disappear in a matter of a few months.

■ Treatment of Maxillofacial Fractures With Complications

Q.—In cases of severe maxillofacial fractures with fractures of the cribriform area complicated by a tear of the dura and cerebrospinal rhinorrhea, is it necessary to delay fracture treatment until the rhinorrhea disappears?—*S.M., San Francisco.*

A.—Cerebrospinal rhinorrhea may continue for a matter of weeks in some instances. During this time, if the maxillofacial bones are not manipulated into position the resultant malunion may produce extreme deformity. It is our opinion that as soon as the patient recovers from shock and is in general good condition three to four days after the injury it is safe to manipulate these bones into position provided the patient is well protected by antibiotic drugs. In many cases, the repositioning of the bones will bring the dura into position where it will seal off spontaneously and the drainage will cease.

■ Reaction of Pain and Trismus After Extraction of Tooth

Q.—Sixteen days ago I removed a partially impacted lower third molar, under inferior alveolar block anesthesia, from a 35 year old man. He got along well for three days and then developed severe trismus with pain in the region of the left mandible. The pain and trismus increased in spite of daily antibiotic therapy. The temperature has ranged from 99.6 to 100.5 degrees. There is no external swelling. The patient complains of pain and inability to open his mouth and difficulty in swallowing. What is this patient's difficulty and how should it be managed?—*L.N.V., Detroit.*

A.—Trismus three or four days after inferior alveolar injection and extraction generally indicates infection introduced at the time of injection. At the end of three or four days, the organisms develop to the point where an abscess begins to form. The inflammatory reaction spreads to the internal pterygoid muscle which goes into spasm causing progressive trismus and pain. The infection may spread to adjacent muscles. Under antibiotic therapy these, many times, do not develop into pyogenic abscesses, but remain as low grade, smoldering infections which continue to produce an extensive inflammatory reaction. Bulging in the region of the anterior pillar of the tonsil or soft palate may be noted. The blood picture generally indicates infection by the presence of increase in the white count and there is usually a slight fever. The picture may be masked somewhat by administration of antibiotics. In this case, using general anesthesia, make an incision in the retromolar region and explore the infected region with a hemostat or blunt pair of scissors. A large abscess may not be found, but providing drainage to the infected region will permit the infection to clear up in a short time.

■ HANDBOOK OF BIOLINGUISTICS. Part I Section A. The Structures and Processes of Expression with General Introduction to Biolinguistics. Clarence L. Meader and John H. Muyskens. Foreword by Leon H. Strong. 330 pages with illustrations. Price $10. Toledo, Ohio: Herbert C. Weller, 1950.

This *Handbook* presents a new emphasis in the study of speech and language which is first met with in the title itself, biolinguistics, the study of speech and language from a biological point of view. As such, the relationship between speech and the field of dentistry becomes an integral one along with other professions requiring background in embryology, anatomy, neuroanatomy, physiology, physics, chemistry and physiological chemistry. While this integration between speech and dentistry is not expressed in actual words in this book, the correlation is always apparent in that the same structures and functions are preempted in both. In addition, biolinguistics relates all of the structures and functions of the body as they contribute to the speech process which then becomes the most highly specific and complex function of the human body. As an integration of biological processes, speech is now recognized as being of the same order as digestion, walking, or the motor components of any of the adjustment pattern scope of man's acquisition of skills.

The importance of embryology, the developing structures and emerging functions, is stressed throughout. Thus, its importance to preventive dentistry as well as to speech habilitation and rehabilitation is especially recognized. The time-space frame of development and differentiation is followed in general but more particularly in relation to the more specific processes and functions from which emerge the vital and coordinative processes of speech so that it can easily be seen that as goes growth rate, so goes the development of the tissue and the emerging specificity.

In a like manner, it is pointed out that any interferences at the critical times and in the critical places (tissues), will have deviating influence on the subsequent functions. The force of the interfering influences may be of nutrition, or of habit formation, or of both. The dentist then will infer that well developed odontoblasts in a well nourished mandible and maxilla, all other things being equal, will have a regular eruption as deciduous teeth, and since the process of speech as an energy and movement phenomenon, rarely observed, are emergences of this period, it becomes self-evident that as go the odontoblasts and mandible and maxilla, so go the tonus properties of the muscles of the face and those of the tongue, the structures most essential for articulatory expression.

Special chapters on refinement of the vital processes show that fragmentation—that is, modifications occurring during the emergence of the speech process—are carefully elucidated. It is only lately that applications such as emerging specificity, speech, and ability to adjust have been calling on the principles of developmental anatomy for explanations of many processes, well analyzed but never fully understood. Education has been talking about the development of children for years and only lately has been able to get a somatic explanation rather than calling on the unexplained mind or the low intelligence quotient to clarify the rate of the learning process.

The *Handbook of Biolinguistics* sets up the principles that give objectivity to an understanding of the speech process and would give a similar basis for the understanding of the large contribution made by dentistry to the young science of experimental phonetics. Much has been received from dentistry for the study of language and speech. My own research work now in progress in conjunction with Elizabeth A. Puglisi substantiates the close contemporaneous interest in the problem of developmental differentiating determinants of

all emerging specificity. The *Handbook*, with its numerous charts, tables, and diagrams is a storehouse of information leading to the development of such thinking, research and ultimate practice.—*Edward T. Coughlin, III.*

■ HARVEY CUSHING: SURGEON, AUTHOR, ARTIST. Elizabeth H. Thomson. 347 pages with illustrations. Price $4. New York: Henry Schuman, Inc., 1950.

This biography is shorter than the original biography of Harvey Cushing by John H. Fulton, and hence is more suitable for the general reader, the dentist and the professional men other than physicians and surgeons. It is both entertaining and informative. It is based largely on Dr. Cushing's letters and diaries, and shows the author's careful selection of material. The illustrations are likewise well chosen and the book is well written.

Harvey Cushing not only led an active professional life but lived a full life with many interests and activities difficult to portray in a biography. The author has been concerned largely with Dr. Cushing's numerous trips abroad, meetings, honorary degrees received and excerpts of his remarks. This provides interesting reading, but when one considers Cushing's illustrious career and his monumental contributions to brain surgery from a medical standpoint, it falls a little short of an over-all biography consistent with his life and work. It would seem that more space might well have been given to his work at Peter Bent Brigham Hospital, his untiring clinical and experimental research, his enthusiasm and devotion to the training of neurosurgeons, and the advance of konwledge in his special field of endeavor.

This book is an outstanding record of a man of intense energy and zeal in search of further knowledge in his special field. An ardent book lover, he sought out all texts portraying the early discoveries in the field of medicine and surgery. An artist in his own right, he reveled in the artistic stimulation afforded him on his numerous trips to Europe. A firm believer in laboratory experimentation, Cushing never lost sight of the fact that the primary concern of all medicine was the good of the patient. Cushing also was an outstanding writer. His *Life of Sir William Osler* was published after five years of meticulous painstaking preparation and gathering of data. It was acclaimed as the greatest medical biography that had ever been written.

This biography of Cushing is recommended for all professional men.—*C. W. Waldron.*

■ EXODONTIA. M. Hillel Feldman. Fourth edition. 290 pages with 322 illustrations. Index. Price $6.50. Philadelphia: Lea & Febiger, 1951.

This book deals primarily with the principles and technic of the extraction of teeth although many related subjects are discussed. The author, in addition to being an exodontist and an oral surgeon, is an anesthesiologist and devotes considerable space to the importance of the choice and administration of anesthetics. A section on chemotherapy gives the author's views on these important drugs. This chapter is well written and brings the reader up to date in this field.

A chapter on infections discusses two long-standing controversial questions. This author advocates the use of cold in certain instances for short periods, but favors heat for more severe infections. He advocates curettement following extraction of teeth associated with chronic periapical infection.

The greater portion of the book deals effectively with instruments, chair positions, operator positions and technics for the removal of teeth and roots as well as unerupted and impacted teeth. The technics advocated are explained in detail with many illustrations. Photographs, line drawings and roentgenograms are used to excellent advantage.

Positioning of incisions is shown in detail. The author favors the use of a bibevel type of drill for removal of bone. He believes this method in his hands is "kinder to tissues" than the mallet and chisel. A chapter on dental malpractice and jurisprudence by Michael A. Hayes gives pertinent information.

In general this book is exceptionally well written. Every statement is carefully worded

and can be easily read. The material is well chosen, well organized and well presented. It is printed on an excellent grade of enameled stock.

Minor differences of opinion regarding certain procedures are to be expected. However, the material presented and the procedures advocated are sound and this book represents a real accomplishment in transmitting information to the dentist in general practice who does extraction and minor oral surgery.—*Paul C. Salisbury.*

■ Pharmacological Basis of Penicillin Therapy. Karl H. Beyer. First edition. 224 pages with 37 illustrations. Index. Price $4.50. Springfield, Ill.: Charles C Thomas, 1950.

All dentists using penicillin should have this book, familiarize themselves with its contents and refer to it frequently. The print is easily read, the table of contents and index have been organized and arranged for quick reference and the figures are well reproduced. Each chapter is headed by a brief, but complete, summary of the text and is ended with pertinent references.

The book reviews the pharmacology, the mode of action, the effects of repository preparations and the excretion of penicillin. The section on pharmacology deals with the various penicillins, their characteristics, assay, antibacterial activity and absorption after administration by routes other than parenteral. The second section is concerned with the levels of penicillin after parenteral administration. Allergic reactions are an important phase in penicillin therapy. Dr. Beyer warns against superficial topical application of penicillin because of its sensitizing potentiality. He states, ". . . it would seem rational to exclude penicillin from most topical uses that can be handled by other means." Since this conclusion appears to be based on cutaneous application, the question of sensitization following application to oral tissues is not answered.

The mode of action is used as a basis for discussing the principles of therapy. The experimental basis for use of repository dosage in contrast to daily dosages of water-soluble salts is discussed. The information on excretion of penicillin and use of Caronamide and Benemid to delay excretion follows logically after dosages.

Penicillin is the drug of choice in prophylaxis and treatment of most oral conditions involving bacteria. Knowledge of the fundamentals of penicillin and its action is essential to intelligent administration.—*Ned B. Williams.*

■ Radiographie Bucco-Dentaire et Agents Physiques en Stomatologie. P. Bertrand, M. Dechaume and G. Lacronique. Second edition. 522 pages with illustrations. Price 1,800 francs. Paris, France: Masson & Co., 1950.

This book is the latest one published in France on dental roentgenology and roentgenographic diagnosis and treatment in mouth diseases.

In the first eight chapters the authors show, in detail, roentgenologic equipment and the basic principles of roentgen rays. In the following chapters, several methods of securing full mouth roentgenograms are described, discussed and illustrated. Extraoral technics for the mandible, maxilla, sinus and temporomandibular joint are also described. The authors mention briefly stereoscopic roentgenography, teleroentgenography and tomography.

The second section of the book deals with diagnosis in roentgenology. This part is divided into two main chapters. The first is devoted to the interpretation of normal roentgenograms. The second part of this section deals with the roentgenographic evidence and diagnosis of various lesions affecting the teeth, mandible, maxilla, temporomandibular joint and sinus. The authors also explain in detail the technic for good sialography and its value in diagnosing diseases of the salivary glands. They also insist on the great diagnostic value of tomographic roentgenograms for the exact localization of all the important lesions of the stomatognathic system. The last section is devoted to a discussion of root canal therapy by ionophoresis, ozone and high frequency current.—*Hratch Abrahamian.*

■ Perlèche from Penicillin Dust. Leonard C. Greenfield. Arch. Dermat. & Syph. 62:909, December, 1950.

Perlèche is usually attributed to infection by streptococcic or monilial organisms; to a deficiency of vitamin B, particularly riboflavin, or to maceration, as from an overhanging upper lip or excessive salivation. To this list should be added another causative factor, penicillin dust that is used for inhalation therapy. Perlèche from any cause is fairly common, but with the increasing popularity of inhalation therapy it is likely that more cases will be encountered. The condition, characterized by scaly, eroded, fissured or macerated lesions at the angles of the mouth, although not serious, does cause some discomfort. In all the cases, when the use of penicillin was discontinued, the condition showed immediate improvement and cleared completely with the use of soothing protective cream.—*J. K. Paul.*

■ Use of Intravenous Procaine in Treatment of Trauma. D. J. Graubard and H. V. Spaulding. Indust. Med. 19:235, May, 1950.

Four years of research in the use of intravenous procaine to relieve the pain and posttraumatic discomfort of various injuries are reported by the authors. They administered 1,783 infusions of 0.1 per cent solution of procaine hydrochloride in 463 cases of trauma, including fractures, postreduction arthralgias, sprains, intervertebral disk rupture, myofascitis, traumatic arthritis and causalgias.

In relieving the pain, the procaine infusions facilitated early rehabilitation. Since dysfunctioning capillaries are as permeable to ions as to colloids, it is believed that seven to eight times more procaine is concentrated at the sight of injury than in other parts of the body. Pain and spasm, therefore, are relieved by the anesthetic action of the procaine when it enters the injured tissue.

The dose of procaine hydrochloride is determined on the basis of the procaine unit, 4 mg. of procaine per kilogram of body weight, and is injected within a period of 20 minutes. No barbiturate premedication was administered and there was no noted sensitivity. There was considerable diminution of cyanosis and edema with the relief of pain.—*Bruce I. Douglas.*

■ The Rate of Penetration of Barbituric Acid Derivatives into the Brain. Thomas C. Butler. J. Pharmacol. & Exper. Therap. 100: 219, October, 1950.

Following intravenous injection of barbital and hexethal (Ortal) in mice, concentrations of the drugs in the brain have been determined by ultraviolet spectrophotometric methods. The concentration of barbital in the brain rises gradually for a considerable time after the injection. The increasing concentration corresponds closely with the increasing intensity of neurological effects. Hexethal, which shows immediate onset of anesthetic effects, attains its maximal concentration in the brain within a short time after the injection. It is concluded that the wide differences among the 5, 5-disubstituted derivatives of barbituric acid with respect to the rate at which their anesthetic effects develop after intravenous injection are attributable to differences in the rates of penetration of the drugs from the blood into the brain.—*J. K. Paul.*

■ Treatment of Malunion Fractures of the Facial Bones. Reed O. Dingman and Robert L. Harding. Plast. & Reconstruct. Surg. 7:505, June, 1951.

These authors point out the desirability of instituting definitive treatment as soon as possible after maxillofacial injuries. They warn, however, about attempting treatment before the patient's general condition permits. Early

care of the soft tissue injuries should be instituted and at the same time, if possible, treatment of the fractures of the zygomatico-maxillofacial compound, nasal bones and the mandible, when compounded extraorally, should be undertaken. In many cases, open reduction can be done through lacerations at the time of treatment of the primary injury before the soft tissues are closed.

The authors point out that delay of treatment of injuries of this type does occur and that deformities result. Some of these deformities result because surgeons are timid about treating maxillofacial fractures in which there is cerebrospinal rhinorrhea. This should not deter treatment provided the patient is in fair general condition and is well medicated with antibiotics.

Various reconstructive procedures are outlined for the management of malunion fractures of the maxillofacial region. The authors prefer single or multiple blocks of iliac bone contoured to the proper shape for correction of skull deformities. Malunion fractures of the nasal bones may be treated by osteotomy and septal reconstruction. In some cases, a graft is needed for support of structures of the nasal dorsum. In this instance, too, cancellous iliac bone is the material of choice. The authors present a method of wiring a single strut gable-shaped iliac bone graft in position. This holds it securely and obviates the necessity for prolonged splinting of the nasal bone graft. In cases of malunion, malposed fractures of the zygoma in which fibrous union makes digital manipulation impossible, the authors describe a method of opening the regions in which the fractures have occurred and breaking up the fibrous attachments with osteotomes. After completely mobilizing the bone, the fragments are wired together by the Adams method. This method has been useful in overcoming diplopia and facial deformity.

Fractured deformities of the maxilla are discussed in detail. Fractures of the maxilla in malposition up to one month's duration can be treated by maxillary traction. This usually will bring the maxilla into position. Fractures up to about four months' duration cannot be managed this way because of fibrous fixation. In cases of this type, the authors describe a method of fitting an impression tray with dental compound to the upper arch. This permits manipulation of the fracture with breaking up of the fibrous tissue and makes it possible to reposition the maxillary fracture in proper relationship. Maxillary fractures that have gone for a period of several months to several years must be treated by an osteotomy in order to permit replacement in proper relationship for occlusion or for subsequent construction of dentures. A method for accomplishing this is described.

In multiple fractures of the maxillofacial bones, where the healing has been in malposition over a period of one to several years, the authors recommend refracture by means of an osteotome through all the sites probably involved in the original injury. After completely breaking up the various components of the maxillofacial compound they are brought into relationship where they are held by means of direct wiring and by means of external appliances.

The article is well illustrated and the methods are well supported by case reports. It should be studied by oral surgeons engaged in the treatment of maxillofacial fractures.—*Reed O. Dingman.*

■ Use of Histamine in Treatment of Bell's Palsy. G. L. Loomis. Arch. Otolaryng. 52:948, December, 1950.

Five cases of Bell's palsy are reported in which prompt and complete response followed treatment with histamine. A daily dose of 250 cc. of histamine diphosphate solution was injected intravenously, in office treatments, for three or four consecutive days. The solution was made by dissolving the equivalent of 1 mg. of histamine base in 250 cc. of isotonic sodium chloride solution, and was injected at a rate which just produced a comfortable flush without a headache. This rate might vary between 20 or 30 drops and 80 or 100 drops a minute. Improvement was noted within a few minutes after injection, showing first as ability to close the eyelids. Pain ceased promptly and the paralysis began to improve. In one case the patient was

given injections of histamine in a concentration of 1:10,000 at home once a day for a week and was then considered cured. Two other patients received supplementary injections of nicotinic acid, 50 mg. daily, following the course of histamine. Complete recovery occurred in all five cases in from 11 days to one month.—*Herbert J. Bloom.*

■ OBSERVATIONS ON THE INFLUENCE OF INTRAVENOUS HISTAMINE ON QUALITATIVE PLATELET ACTIVITY IN COAGULATION. Stuyvesant Butler and others. J. Lab. & Clin. Med. 36:710, November, 1950.

Increased histamine blood levels appear to increase directly the qualitative disintegrative ability of the platelets. This activity has been measured by increased speed of coagulation of whole blood, platelet-rich plasma (plasma A) and platelet-free plasma (plasma B). Small concentrations of histamine do not influence the total platelet count but seem to accelerate the clumping of platelets in a plasma-platelet-heparin solution. Intravenous infusions of very high concentrations of histamine cause a decrease in the number of platelet in the circulating blood. Heparin in high concentrations does not inhibit completely the increased tendency toward *in vitro* agglutination of platelets exposed *in vivo* to histamine. Controlled animal experiments show that in states of shocklike activity produced by massive amounts of histamine, disintegrative platelet activity is still further increased.—*J. K. Paul.*

■ USE OF NEMBUTAL TO COMPLEMENT CONDUCTION ANESTHESIA. H. M. Ausherman and O. B. Crawford. Postgrad. Med. 8:287, October, 1950.

The use of Nembutal by slow intravenous injection to produce amnesia or light sleep in conjunction with local or regional anesthesia has been found of advantage by the authors particularly in patients given spinal anesthesia. The dose may be judged accurately by maintaining conversation with the patient during the slow injection (1 cc. of 5 per cent solution of Nembutal per minute): when the patient ceases to respond, an additional cubic centimeter is given and the needle is withdrawn from the vein. Maximal depressive effect is reached 10 to 15 minutes after the injection. Use of Nembutal in this way does not increase laryngeal reflexes and permits insertion of an airway or passage of a Levin tube without fear of laryngospasm. The amnesic effect of morphine or scopolamine is enhanced by Nembutal, thus necessitating lower dosage if these analgesic drugs must be used. Nembutal also protects against untoward reactions occasionally occurring during conduction anesthesia. Slow injection (1 cc. per minute) is necessary to avoid overdosage.—*Herbert J. Bloom.*

■ EFFECT OF SCHEDULE OF ADMINISTRATION ON THE THERAPEUTIC EFFICACY OF PENICILLIN. Harry Eagle, R. Fleischman and A. P. Musselman. Am. J. Med. 9:280, September, 1950.

There is much controversy as to whether penicillin should be given in small multiple divided doses or in one large dose. To determine which method was most effective, experimental animals were inoculated with bacterial organisms. "In every such experiment, with all the bacterial species tested, regardless of the route of inoculation or the time of treatment, relative to inoculation, the curative dose of aqueous penicillin was many times greater when the drug was given in a single injection than when given in divided doses." Dosages which cured 90 per cent of the animals when divided in multiple doses often failed to cure any when given in a single injection. The opposite was found with organisms highly susceptible to penicillin, in which case a single injection was as effective as multiple divided doses, and in some cases more effective.

Too long an interval between injections can operate to reduce the therapeutic efficiency of aqueous penicillin. If the interval is too long the bacteria which have been damaged but not yet killed by penicillin recover from the toxic effects of the drug, and resume multiplication

at a normal rate. This remultiplication during the penicillin-free interval counteracts the effect of the preceding treatment. "The determinate factors in the therapeutic activity of penicillin are the total time for which it remains at bactericidal levels, supplemented by the time for which, with some bacterial species, organisms damaged but not yet killed by the drug, continue to die under the impact of the host defense mechanisms even after the drug has disappeared."

Even though bacteria remain static in number or continue to die after penicillin has fallen below the bactericidal level, this does not mean that such a discontinuous method of treatment is to be preferred to methods which assure the maintenance of maximally effective concentrations at the focus of infection. Bacteria die much faster under the combined impact of penicillin and the body's defense mechanisms. "Penicillin suspended in absorption-delaying vehicles which provides a reasonably sustained but low level should be just as effective as multiple injections of aqueous solution, provided only that the absolute concentration attained at the focus of infection is in excess of that necessary to kill the particular organism at the maximal rate."—*Herbert J. Bloom.*

■ Dryness of the Mouth. Herman V. Allington. Arch. Dermat. & Syph. 62:829, December, 1950.

Dry mouth is a disturbance due to many different causes. Alone it is distressing and may cause severe local changes but does not preclude reasonably good general health. The anatomy and physiology of the salivary glands are complicated, and salivary function is sensitive to changes occurring in many, if not all, of the systems of the body.

Inadequate amounts of saliva and mouth dryness may result from such causes as congenital hypoplasia or absence of the salivary glands; loss of gland substance due to surgical operation, roentgen ray or radium damage or infiltration by specific disease, or inadequate secretory stimulation due to organic lesions of the nervous system, chemical disturbances in conduction or reception of nerve impulses and the effect of drugs or toxic agents. Temporary dryness of the mouth may result from mouth breathing, excessive speaking and normal emotional reactions. There is both clinical and experimental evidence that abnormal emotional states, neuropsychiatric disorders and psychoses may cause prolonged salivary suppression. Salivary secretion is lessened by dehydration, and dry mouth may occur as a symptom in acute febrile diseases, diabetes mellitus and insipidus and other systemic diseases.

Idiopathic dryness of the mouth and dryness of the eyes (keratoconjunctivitis sicca) commonly occur together. Dryness of the mucous membranes of the nose, throat and vagina and deficient stomach secretion may also be present. Such cases are often considered as examples of a syndrome usually designated as Sjögren's syndrome or the sicca syndrome. There are similarities between many of the features of this syndrome and the changes seen in deficiencies of vitamin A, nicotinic acid and riboflavin and in pernicious anemia, iron deficiency anemia and the Plummer-Vinson syndrome. The frequent coincidence of chronic rheumatoid arthritis, dry mouth and keratoconjunctivitis sicca is especially noteworthy. Rapid blood sedimentation rate, relative lymphocytosis and focal infection are common associated observations. The sicca syndrome occurs most frequently in women past the menopause. This and hormone titration experiments indicate the hormonal insufficiency may be etiologically important.

It seems probable that varying combinations of the disturbances discussed result at times in inhibition of salivary and lacrimal secretions while an otherwise normally functioning human organism can adequately compensate for one or a few of them. As the varying etiologic factors involved in this syndrome are better understood individual cases may, perhaps, be more accurately classified.—*J. K. Paul.*

Announcements

■ Oral Pathology Board Will Hold Exams October 15

Examinations for certification by the American Board of Oral Pathology will be held October 15 at the Armed Forces Institute of Pathology, Washington, D. C.

Further information may be obtained by writing to Colonel Joseph L. Bernier, secretary, American Board of Oral Pathology, Armed Forces Institute of Pathology, Seventh Street and Independence Avenue, S.W., Washington, D. C.

■ Cancer Now a Reportable Disease in Washington, D. C.

Cancer and all malignant neoplastic diseases in Washington, D. C., were made reportable to the District of Columbia health officer in a bill (Public Law 83) signed by President Truman on July 27.

■ Fall Meeting of the American Society for the Advancement of General Anesthesia in Dentistry

The fall meeting of the American Society for the Advancement of General Anesthesia in Dentistry will be held on October 22, 1951, at the Shelburne Hotel, Lexington Avenue and Thirty-seventh Street, New York.

For further information write M. Hillel Feldman, executive secretary, 730 Fifth Avenue, New York.

■ Graduate and Postgraduate Studies at Tufts College Dental School

Courses in minor oral surgery will be presented throughout the academic year of 1951-1952. Tuition will be $125 for the eight weeks from October 3 to November 21, 1951, and January 23 to March 12, 1952. Tuition will be $100 for the period from June 2 to 6, 1952.

Information may be obtained by writing to the director of the Division of Graduate and Postgraduate Studies, Tufts College Dental School, 136 Harrison Avenue, Boston 11.

■ Ohio State University Announces Its Postgraduate Courses for the Fall of 1951

The College of Dentistry, Ohio State University, will offer postgraduate courses in dentistry during the fall of 1951, on the following schedule: anatomy of the head and neck, September 24-28; general anesthesia, October 8-12; oral pathology, October 29-November 2; oral surgery, November 5-9; x-ray, December 3-7.

Each course is given for five consecutive days, Monday through Friday, and the enrollment is limited to approximately ten per class. The fee is $50 per course with the exception of oral surgery, which is $100.

Further information and application may be secured from the Postgraduate Division, College of Dentistry, Ohio State University, Columbus 10, Ohio.

■ Middle Atlantic Society of Oral Surgeons and the West Virginia Society of Oral Surgeons Merge

In July, 1951, the Middle Atlantic Society of Oral Surgeons held a meeting at White Sulphur Springs, West Virginia, in conjunction with the annual meeting of the West Virginia Society of Oral Surgeons. As a result of this meeting, there was an amalgamation of the two societies; the West Virginia Society was dissolved and in the future will be known as the West Virginia Section of the Middle Atlantic Society of Oral Surgeons. This was felt to be a step toward closer relationship and cooperation between members of the oral surgery specialty in the Middle Atlantic area.

■ American Board of Oral Surgery Will Hold Exams

The American Board of Oral Surgery will hold examinations at the Wardman Park Hotel, Washington, D. C., October 6-9, 1951. For further information address Dr. Leslie M. FitzGerald, 718 Roshek Building, Dubuque, Iowa.

■ Annual Meeting of the American Association for the Advancement of Science

The one hundred and eighteenth annual meeting of the American Association for the Advancement of Science will be held in Philadelphia, December 26-31, 1951. The program will include all eighteen of the Association's sections and about forty-five participating societies.

Further information may be obtained by writing the assistant administrative secretary, 1515 Massachusetts Avenue, N.W., Washington, D. C.

■ Dentists Invited To Visit National Dental Museum During Annual Session of the Association

The ninety-second annual session of the American Dental Association in Washington October 15-18 provides opportunity for members of the dental profession to visit the National Dental Museum, dental section of the Army Medical Museum located in the Armed Forces Institute of Pathology.

Adopted as the National Dental Museum 56 years ago by the Association, the Museum has been redesigned and reconstituted under the sponsorship of the Council on Dental Museum and Registry and, according to Herbert A. Swanson of Washington, D. C., chairman of the Council, invites the critical eye of Association members, as well as contributions of additional specimens. Gross and microscopic material, and especially casts, instruments and appliances, are needed to fill gaps in the collection, according to Col. Joseph L. Bernier, executive secretary and pathologist at the Registry and chief of the Dental and Oral Pathology Section of the Institute.

In addition to the Museum, the Dental Registry, under the Council's direction, now contains approximately 9,000 case reports which are available for statistical and other studies, Dr. Swanson reports.

■ List of Approved Hospital Dental Departments

The latest list of hospitals having dental departments approved by the Council on Hospital Dental Service of the American Dental Association was published in the August 1951 issue of *The Journal of the American Dental Association*, pages 194-200.

■ New York University-Bellevue Medical Center Offers Internships and Residencies

There are six internships (one year), one assistant residency and a one year residency at the New York University-Bellevue Medical Center. These are surgery appointments and the prerequisite for the internships is graduation from an approved dental school. For the residency, a medical and a dental degree are preferred but not required.

For information write the secretary, Oral Surgery Department, New York University College of Dentistry, 209 East Twenty-third Street, New York 10.

■ Ninety-second Annual Session of the American Dental Association

The American Dental Association will hold its ninety-second annual session in Washington, D. C., October 15-18, 1951. The scientific meetings, including color television programs of dental operations performed at the Mount Alto Veterans Administration Hospital, will be held in the National Guard Armory.

The Board of Trustees and the House of Delegates will meet in the Hotel Statler. Both the Statler and the Mayflower have been designated official hotels. An attendance of 15,000 is anticipated.

■ International Dental Congress Scheduled To Meet in London

The eleventh International Dental Congress, sponsored by the Fédération Dentaire Internationale, will be held in London, July 19-26, 1952. Scientific reports to be presented for discussion at the Congress will be published in the four issues of the *International Dental Journal* dated September 1951 to June 1952.

For further information write to G. H. Leatherman, Honorary Secretary, 13 Hill Street, London, W. 1.

■ Annual Meeting of the American Society of Oral Surgeons

The American Society of Oral Surgeons will hold its annual meeting in the Wardman Park Hotel in Washington, D. C., October 10-13, 1951.

■ Eighth Annual Dental Seminar

Two hundred dentists, including top dental-medical researchers, will be in attendance at the eighth annual Dental Seminar to be held at the Desert Inn, Palm Springs, California, October 28 through November 1, 1951.

A Paradentopathies Workshop will be a major feature of the professional gathering, with the participants divided into special study groups devoted to various phases of the problem.

■ Sixth Annual Meeting of the Academy of Oral Pathology

The Academy of Oral Pathology will hold its sixth annual meeting at the Stevens Hotel, Chicago, February 3, 1952.

The program will include discussions on the physiology of bone, bone behavior, periodontal disease, dermatological diseases affecting the oral cavity, studies of oral carcinomas, dental anomalies and gingival enlargement.

All interested dentists are welcome to attend.

Editorial communications

■ ORIGINAL COMMUNICATIONS—This journal invites consise original contributions in the broad field of clinical and experimental surgery of the mouth and associated structures, including roentgenology, diagnosis, anesthesia and oral surgical pathology. Articles are accepted for publication with the understanding that they are contributed solely to the JOURNAL OF ORAL SURGERY. All manuscripts are subject to editorial modification. Neither the editors nor the publishers accept responsibility for the views and statements of authors expressed in their communications.

■ MANUSCRIPTS—Manuscripts submitted for publication should be sent to Reed O. Dingman, Editor, 221 North Ingalls Street, Ann Arbor, Michigan.

Manuscripts should be typewritten on one side of the paper only with double spacing and liberal margins. The author's name and the abbreviated title of the article should appear at the top of each manuscript page. The original should be sent to the editor and a carbon copy retained by the author. Manuscripts will not be returned if accepted for publication.

References should be placed at the end of the article and should conform to the style of the Quarterly Cumulative Index Medicus; viz., name of author, title of article and name of periodical with volume, pages, month and year. They should be numbered and should appear in the same order as that of the superior figures inserted in the appropriate positions in the text.

■ ILLUSTRATIONS—Illustrations accompanying manuscripts should be unamounted and numbered. The author's name should appear on the margin or back.

Authors should insert figure numbers at appropriate places in the text. The original drawings, or glossy print photographs of them, should accompany the manuscript. Legends for illustrations are to be typewritten in a separate list with numbers corresponding to those on the photographs and drawings.

A reasonable number of halftone illustrations will be reproduced free of cost to the author, but special arrangements must be made with the editors for color plates, elaborate tables or extra illustrations. Copy for zinc cuts (such as pen drawings and charts) should be drawn and lettered in India ink or with black typewriter ribbon (carbon paper placed with carbon against back of sheet for bolder type). Ordinary blue or colors will not reproduce. Only good photographic prints or drawings should be supplied for halftone work.

■ CASE REPORTS—Case reports will constitute an important department of the journal and the editors welcome case reports that are of unusual clinical value or that present exceptional conditions of interest to dental surgeons.

■ EXCHANGES—Letters, exchanges, reprints and all other communications relating to the JOURNAL OF ORAL SURGERY should be sent to the American Dental Association, 222 East Superior Street, Chicago 11.

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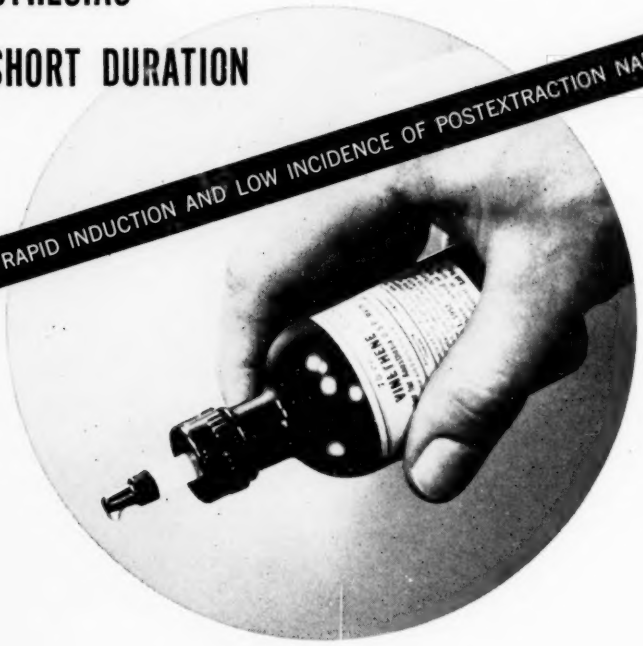

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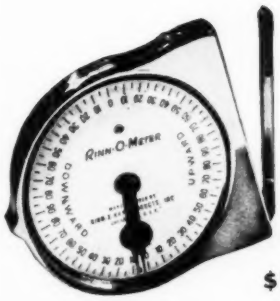

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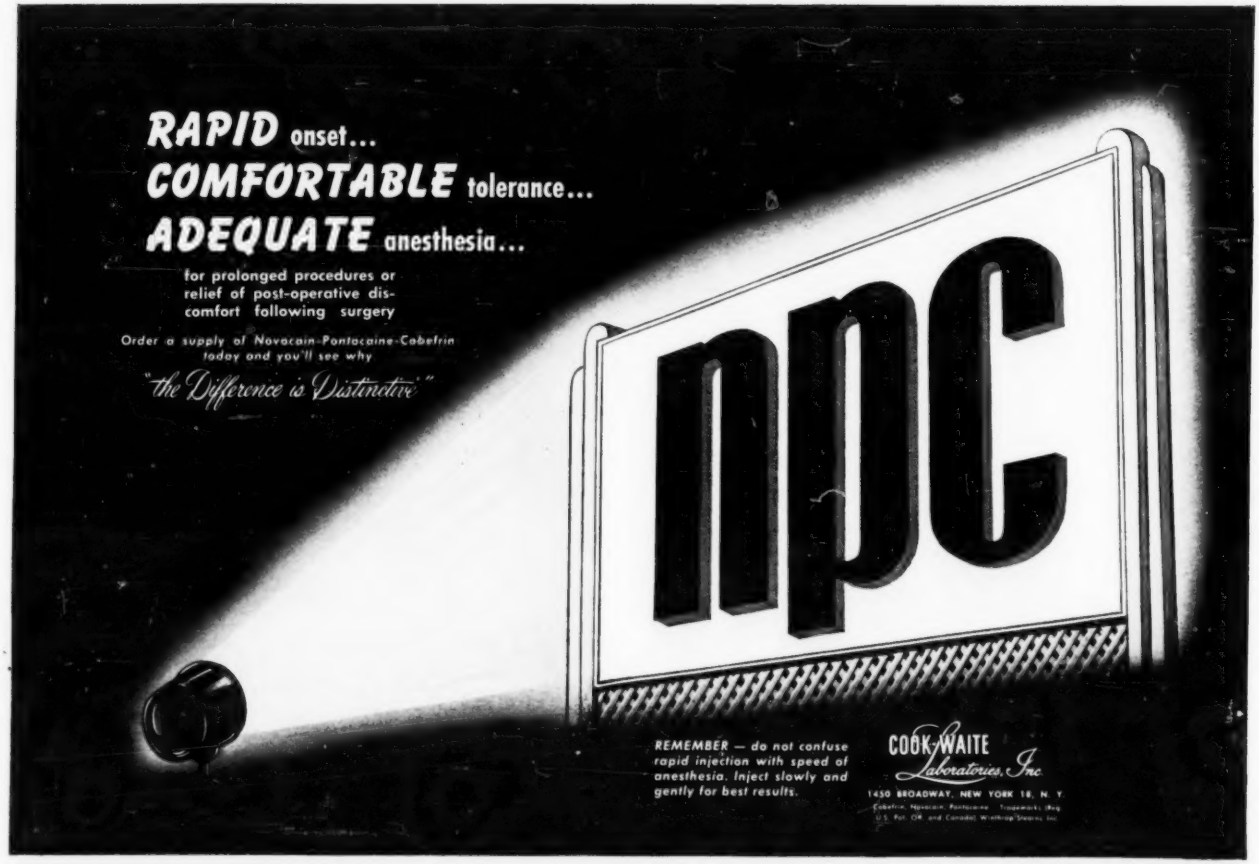
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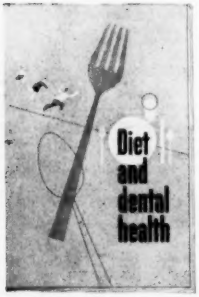

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